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HAMILTON/
WENTWORTH

Rapid Transit Project

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RESEARCH UNIT FOR URBAN STUDIES
McMASTER UNIVERSITY
HAMILTON, ONTARIO

DRAFT ENVIRONMENTAL ASSESSMENT

Report HW-1-21.0 October 1981

metro canada limited

004796

Errata

1. pg. 1-19: the quote from the Regional Official Plan, Sec. 9.3.8 should read: "That a transit system with increased transit capacity receive a high priority in transportation planning in the urban areas of the Region, especially in the corridor connecting downtown Hamilton to the sub-regional centre on the Hamilton Mountain."

2. pg. 1-32: the sentence at the top of page 1-32 should be at the bottom of page 1-33.

3. pg. 5-41: the approximate market value of a home assessed at $5,000 in 1981 is $46,500.

SUMMARY

The purpose of this report is to provide an outline for the Environmental Impact Assessment for the proposed Hamilton-Wentworth Rapid Transit Project. This is a draft document, which together with the accompanying Functional Plan, describes the proposed Hamilton-Wentworth Rapid Transit System (ICTS) and its associated environmental impacts. Measures needed to mitigate these impacts are discussed and results of the public participation program are presented.

It should be noted that this document is intended as a discussion paper only, as the data base reflects the extent of information available at the time of printing.

Additional information - to be provided during the detailed design phase - would be required in some topic areas in order to meet the full reporting requirements of the Environmental Assessment Act, 1975.

As envisaged, the proposed ICTS would provide for an integrated transit service between Hamilton Mountain and the downtown. In addition to satisfying many local and regional goals for rapid transit, ICTS is likely to provide impetus to future growth and development, locally and regionally, while satisfying future demands for travel.

By providing a viable alternative to the existing road-based transportation network in the Mountain Corridor, ICTS would encourage rapid transit use and reduce traffic congestion, downtown parking demand, traffic-related pollution problems and local dependence on fossil fuels. At the same time, ICTS would provide a focus for an integrated regional transportation system.

Moreover, because of its special urban character and unique topographic feature in the form of the Niagara Escarpment, the City of Hamilton offers a full range of opportunities and constraints necessary to demonstrate ICTS technology in a revenue service application.

ICTS, as proposed, features the use of totally automated, light-weight vehicles which are powered by special linear induction motors (LIM). The vehicles operate as a married pair, or as a four car train on an exclusive right-of-way. Over most of its alignment, ICTS would operate on an elevated concrete or composite steel concrete guideway supported by isolated piers. Most system components are pre-cast or pre-fabricated, thus minimizing local disruption during the construction stage. For applications at-grade or below, the guideway would consist of continuously reinforced concrete.

The proposed ICTS will be approximately 8 km (5 miles) in length (round trip), of which 6.7 km (4.2 miles) is to be elevated and the remainder, or about 1.3 km (0.8 miles) is to be tunnelled through the Niagara Escarpment.

A total of five (5) stations will be provided. One of these stations is to be situated underground, while the others would be elevated. Two optional stations are also being considered on the route for future service in the downtown.

The route to be followed by ICTS is illustrated in Figure 1.4 (page 1-10). Essentially, ICTS follows existing public rights-of-way or is confined to land zoned primarily commercial. Dislocation of existing residential use is not anticipated.

Construction of the proposed ICTS, if approved, would take approximately 4 to 5 years to complete at a total estimated cost of $111.1 million, assuming termination at the intersection of Mohawk Road and Upper James Street.

It is proposed that the cost of ICTS be shared jointly by the Federal, Provincial and local Regional governments. Under this proposal as yet to be accepted, the Federal and Provincial governments would bear 90%, while the Regional government would assume 10% of the total capital cost.

In this report, information pertaining to the physical, biological social/economic environmental condition of the Mountain Corridor and Region is provided. Major environmental factors include: air quality; water quality; climate; geology; topography; soils; hydrology; wildlife and vegetation; land use; existing transportation systems; patronage and revenue considerations; historical and archaeological sites; views and aesthetics; quality of life; utilities; social and economic conditions; noise; and future development potential. Note: The discussion of these environmental factors reflects the extent and degree of completeness of the data base which was available at the time of printing.

Construction and operation of ICTS would result in a number of beneficial and adverse environmental impacts. These include:

Construction Impacts (Short-term)

Beneficial	Adverse
° Additional job creation (in excess of 2 000 man-years estimated)	° Noise and Vibration
° Impetus for new growth and development	° Dust
° Increased economic investment opportunity	° Traffic Congestion
° Stimulus to local economy (some ICTS components could be manufactured locally)	° Temporary business disruption (locally)
° No residential property required	° Visual and aesthetic disruption
	° Costs
	° Some commercial property acquisition

Operation Impacts (Long-Term)

Beneficial

- Reduced overall community noise
- Reduced automobile exhaust emissions
- Reduced traffic congestion
- Improved access to downtown
- Reduced travel time and cost
- Energy savings
- Improved safety
- Possible impetus to growth and development
- Reduced parking requirements in downtown
- Focus for office growth downtown

Adverse

- Visual and aesthetic disruption
- Traffic congestion around stations and parking lot entrances
- Above-ambient noise levels in a few isolated locations

Some adverse construction impacts are anticipated during the construction of tunnel section between Fennell Avenue and the lower tunnel portal in the vicinity of Upper James Street and the Niagara Escarpment.

With the route selected for ICTS, coupled with appropriate design of the final system and proper timing/scheduling of construction, it would be possible to mitigate most adverse environmental impacts associated with ICTS. It should be noted, however, that the quantification of some impacts, in relation to specific mitigation requirements, will only be possible during the detailed design phase.

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1.0

INTRODUCTION

1. INTRODUCTION

1.1 General

This document is an assembly of available information from reports prepared by Metro Canada Limited and its Hamilton-Wentworth rapid transit project sub-consultants. It is intended to provide an outline for the Environmental Impact Assessment for the proposed Hamilton-Wentworth Rapid Transit project. Figure 1.1 illustrates the procedural steps to be followed in preparing this Environmental Assessment.

This document is to be read in conjunction with the accompanying Functional Plan. Together, these documents provide the following information:

a) A description of the proposed Hamilton-Wentworth Rapid Transit System

b) Background history for the proposed undertaking

c) A description of the process leading to the selection of the proposed route

d) A general description of the existing environment, including natural, social and economic conditions

e) An outline of the major environmental impacts identified during the Hamilton-Wentworth Pre-Implementation Study

f) Preliminary consideration of measures to mitigate these environmental impacts

g) Results of the Public Participation Program

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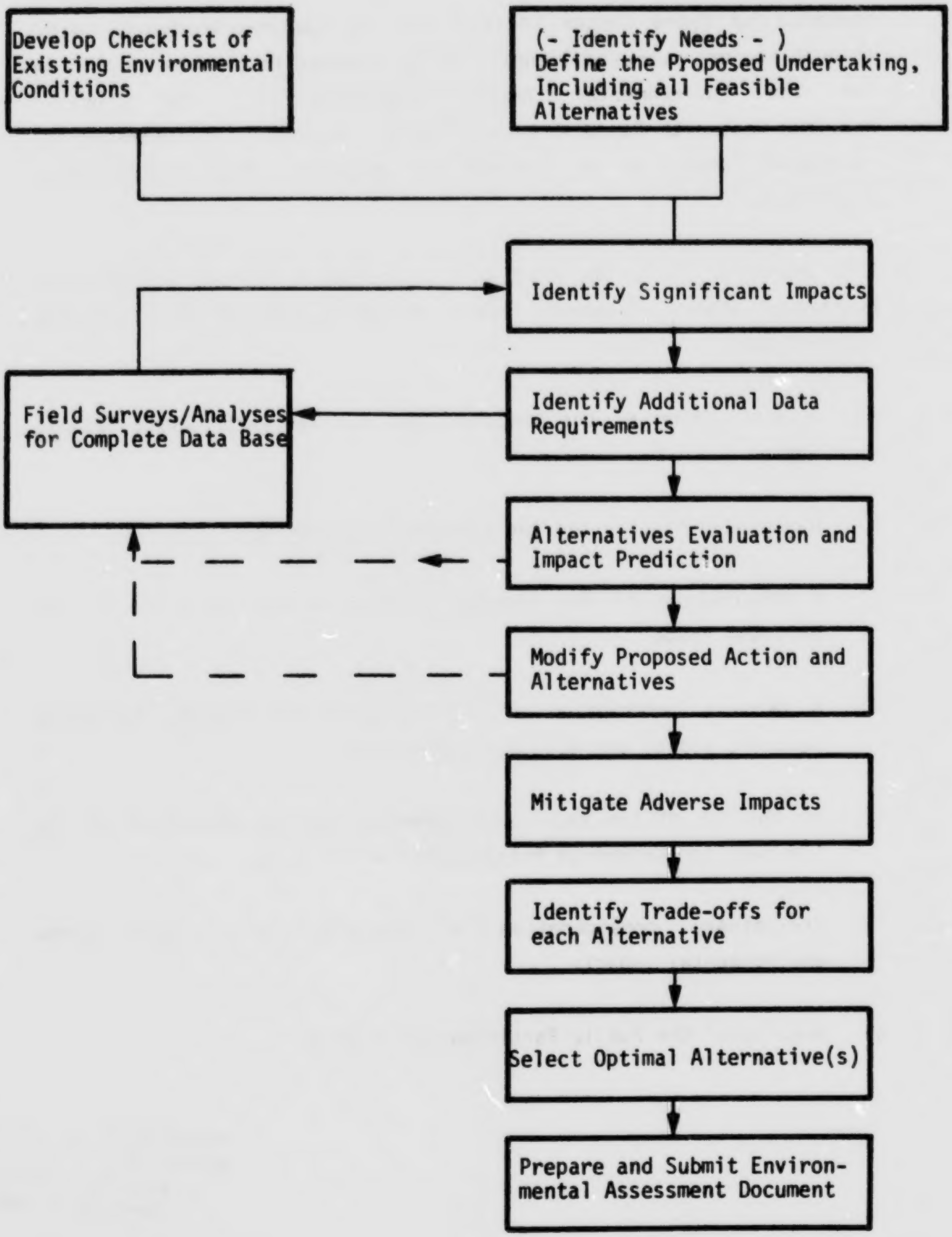
Figure 1.1 PRINCIPAL STEPS IN AN ENVIRONMENTAL ASSESSMENT


Develop Checklist of Existing Environmental Conditions
(- Identify Needs -) Define the Proposed Undertaking, Including all Feasible Alternatives
Identify Significant Impacts
Field Surveys/Analyses for Complete Data Base
Identify Additional Data Requirements
Alternatives Evaluation and Impact Prediction
Modify Proposed Action and Alternatives
Mitigate Adverse Impacts
Identify Trade-offs for each Alternative
Select Optimal Alternative(s)
Prepare and Submit Environmental Assessment Document

This is a draft document intended as a discussion paper; it is preliminary in scope and therefore subject to revision as Regional Council makes decisions concerning the project, and as final designs are prepared for the system. This document and its companion Functional Plan, and their supporting technical reports and working papers, address the major factors related to the implementation of ICTS in Hamilton-Wentworth. With reference to the specific reporting requirements of the Environmental Assessment Act, 1975,(1,2) it should be noted that there is absent in this draft report full documentation and discussion in a number of important subject areas, which are either available in other reports identified below or will be prepared and added by the Region as part of their discussion and decision-making process.

Information In Other Reports

- ### Comparison of Alternate Transportation Modes

  Transportation alternatives to the proposed ICTS undertaking, will be reviewed to assess their service capabilities, costs, urban integration potential and environmental impacts. An alternative modes analysis has been prepared and will be available after review by Regional staff.

- ### Functional Plan

  A full description of the undertaking is contained in the Function Plan report.

- ### Tasks E-2 and E-3

  Description of the natural environment and quantification of the related environmental impacts.

Final Design Details

- Specific details of identified potential adverse environmental effects which cannot be avoided must be quantified during the final design should the proposal be implemented. Mitigative measures for environmental impacts will be developed during the detail design.

- Irreversible or irretrievable commitments of natural resources (e.g., construction materials) must be quantified in the final design phase.

- Although generalized mitigative measures have been discussed in this study, mitigation and monitoring techniques for the proposed undertaking should be considered in further detail as part of the final design and Council decision process.

It is understood that this information, when available, would be included as part of the final Environmental Assessment.

1.2 Description of the Undertaking

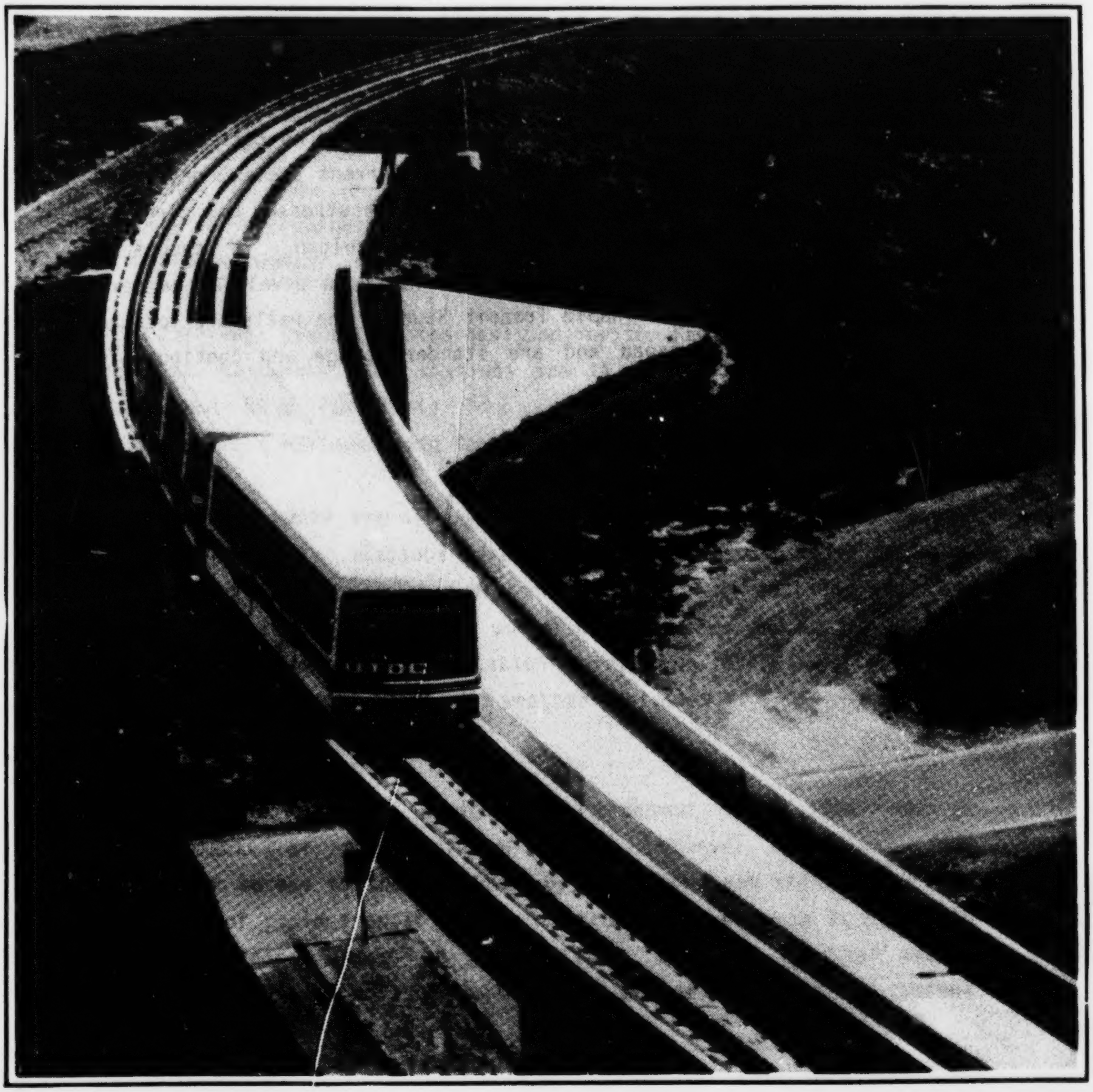
1.2.1 - WHAT IS ICTS?

ICTS is an acronym for 'Intermediate Capacity Transit System'. Given the special and often varied transit needs of urban areas, the ICTS was developed by the Urban Transportation Development Corporation of Ontario (UTDC) as a low-cost, practical alternative to conventional subway systems (Heavy Rail Transit) or streetcars (Light Rail Transit) and buses. Operating in an intermediate capacity range, ICTS is designed to carry 5 000 to 25 000 passengers per hour per direction, which is between the normal operating ranges of subways and streetcars operating on streets.

The ICTS features the use of small-to-medium sized vehicles operating on exclusive rights-of-way. The normal operating mode for ICTS is an elevated guideway (Figure 1.2). However, where local circumstances

FIGURE 1.2

ICTS - TYPICAL CONFIGURATION



dictate, the ICTS is equally well adaptable to applications at-grade or below grade. By employing a combination of special technological features and automated control systems, ICTS provides high frequency operation that is both safe and reliable.(3)

1.2.2 - WHAT DOES ICTS LOOK LIKE?

Conventionally, ICTS is supported over most of its length by an elevated, double-track guideway. The guideway can be constructed of concrete or composite steel/concrete. The current system, developed by UTDC, features the use of two continuous pre-stressed box girders, set parallel and supported by a single column. A composite steel/concrete design of a similar nature has been developed as part of the Hamilton-Wentworth Rapid Transit Study. The rails are located on the deck of each span and are standard gauge and continuously welded.

The main guideway girders are typically 2.85 m (9.3 feet) wide, 1.33 m (4.4 feet) deep and 30 m (100 feet) in length for concrete up to 45 m (150 feet) in length for a composite steel/concrete span. The girders are in turn supported by a minimum number of support columns. For construction of the system at-grade or below grade, the ICTS guideway is constructed of a continuously reinforced concrete slab, approximately 200 mm (8 inches) thick.

The passenger vehicles used for ICTS are 12.7 m (42 feet) long and 2.5 m (8 feet) wide. The vehicles are light-weight, spacious and designed to enhance passenger comfort. The vehicles can operate singly or in combination as a train, depending on local user needs and expected passenger volumes.

For the rapid transit system designed for the Regional Municipality of Hamilton-Wentworth, the stations are 12 - 14 metres (40 - 45 feet) wide and 55 m (180 feet) long. These stations are designed to accommodate a maximum train length of four vehicles.

To make the rapid transit system as attractive to potential transit users as possible, stations have been located close to major activity centres to minimize walking distances. Major intersections are also served by stations to minimize out-of-way passenger and bus travel and to serve the major transportation corridors. Where possible, bus transfers are "paper free" and weather-protected to enhance passenger convenience and comfort.

Site-specific station designs will depend upon final design requirements of the preferred route. However, stations allow passenger access to the platforms by escalators and stairwells. The majority of rapid transit users will transfer from buses or will walk in from areas adjacent to the stations. A "kiss 'n ride" and/or parking facilities will be desirable at the terminal station (Mohawk Station).

At the station, fare collection areas may have attendants for walk-in transit users. For bus transfers, direct transfer facilities can be designed to allow free movement from the bus to the rapid transit platform.

The means of access to the platform of an elevated, or below grade, rapid transit station will be by automatic escalator. Back-up stairways and emergency exits will be provided. This will permit the rapid transit system to be used by all people who now use the existing HSR bus service, including the elderly and the ambulatory handicapped. It is understood that the patrons of the Region's transportation system for the disabled (DARTS) will continue to use that system.

1.2.3 - HOW DOES ICTS OPERATE?

The suspension for the ICTS vehicles is provided by steel wheels and steel track (Figure 1.3). The axle and suspension assemblages are steerable, thus contributing to a high degree of rider comfort, while reducing wheel noise on curves and keeping wheel and rail wear and general maintenance to a minimum.

Propulsion and braking for the ICTS is provided by a Linear Induction Motor (LIM). Compared to conventional electric motors used in other transit vehicles, the LIM has no moving parts, nor does it rely on wheel/track friction for traction in accelerating or decelerating the vehicles. Also, because the ICTS vehicles are not subject to wheel slip or slide, ICTS facilitates a high level of performance even on steeper grades, under all climatic conditions. For instance, LIM permits line headways* of under forty (40) seconds and station headways of sixty (60) seconds, including twenty (20) second dwell time at the stations. This level of performance can be maintained at cruise speeds of 72 km/hr (45 mph) on grades up to six percent.

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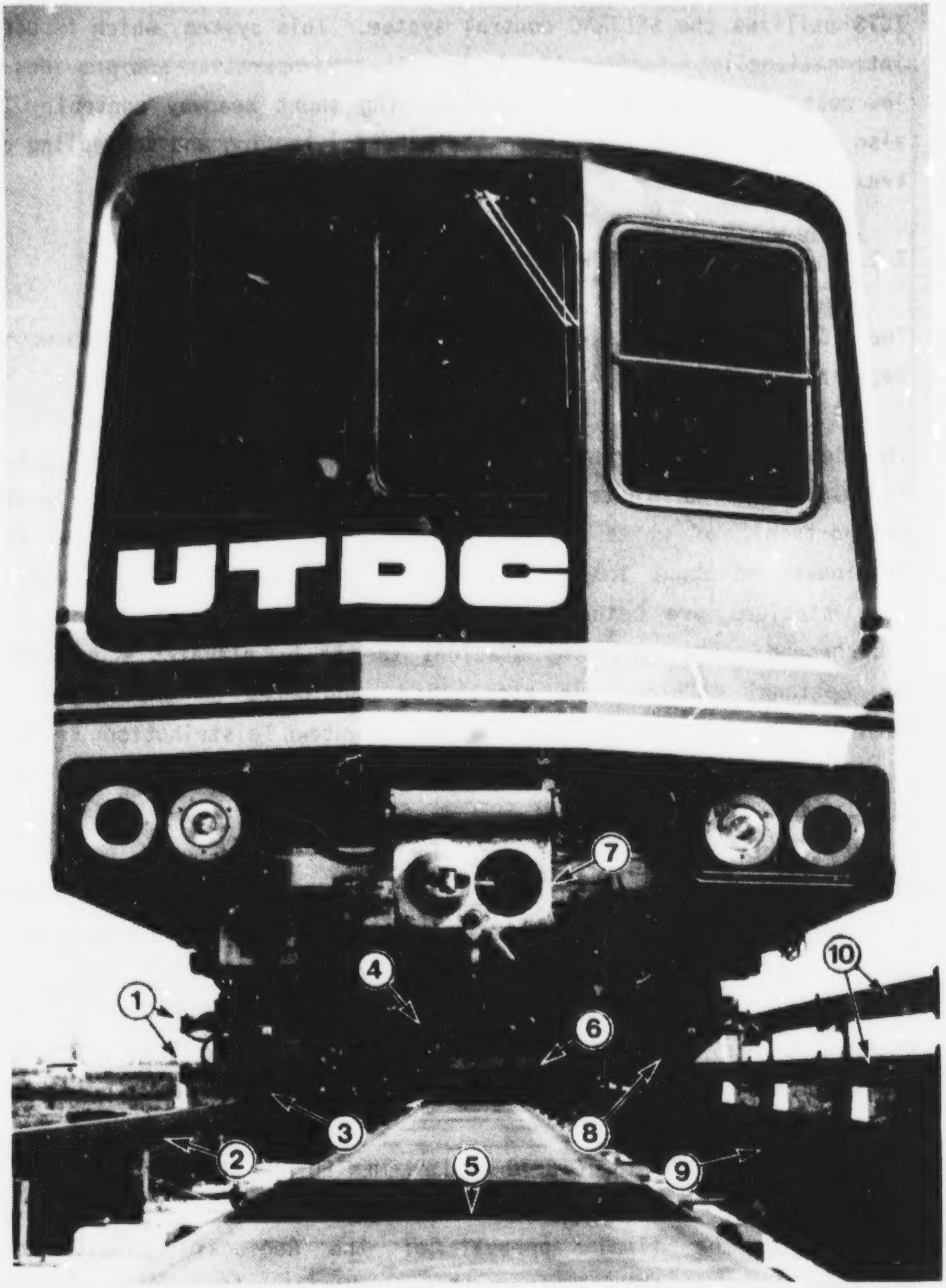
* Headway - the time interval between two trains or vehicles travelling in the same direction on the same route.

FIGURE 1.3 ICTS VEHICLE/GUIDEWAY INTERFACE



1)	Current Collector Shoes	6)	Linear Induction Motor (LIM)
2)	Steel Rail	7)	Automatic Coupler
3)	Steel Wheel	8)	Automatic Train Control Antennae
4)	Axle	9)	Automatic Train Control Cable
5)	LIM Reaction Rail	10)	Power Rails

ICTS utilizes the SELTRAC control system. This system, which is used internationally, facilitates fully automated operation and provides a low-cost, flexible method of maintaining short headway control. It also permits remote changes in the make-up, routing and scheduling of trains.

1.2.4 - WHERE IS THE PROPOSED ICTS TO BE LOCATED?

The ICTS route selected for detailed study by Hamilton-Wentworth Regional Council on July 21, 1981 is illustrated in Figure 1.4.

The details of the route are described in Figures 1.5.1 to 1.5.4 inclusive. The route is approximately 8 km (5 mi) in length (round-trip), of which 6.7 km (4.2 mi) is to be elevated and the remainder, or about 1.3 km (0.8 mi) is to be tunnelled. A total of five stations are being proposed, one of which is to be located underground. The remaining stations are to be elevated structures. Two optional stations are also being considered on the route for future and improved service in the downtown distribution system.

1.2.5 - DOES THE ICTS REQUIRE SPECIAL SKILLS?

Except for expertise required in the design of steel and concrete structures, the design of guideways and stations for ICTS requires no special production or installation skills. Except for some specialists in electronic and computer fields, conventional skills and techniques are required to operate and maintain the ICTS. Project implementation will incorporate an introductory training program.

1.2.6 - WHEN AND HOW IS ICTS TO BE IMPLEMENTED AND CONSTRUCTED?

Subject to the final approval of the Regional Council, the implementation of the proposed ICTS in Hamilton-Wentworth would be contingent on a number of factors related to planning and development,

FIGURE 1.4 RAPID TRANSIT ROUTE CHOSEN BY HAMILTON-WENTWORTH REGIONAL COUNCIL - JULY 21, 1981

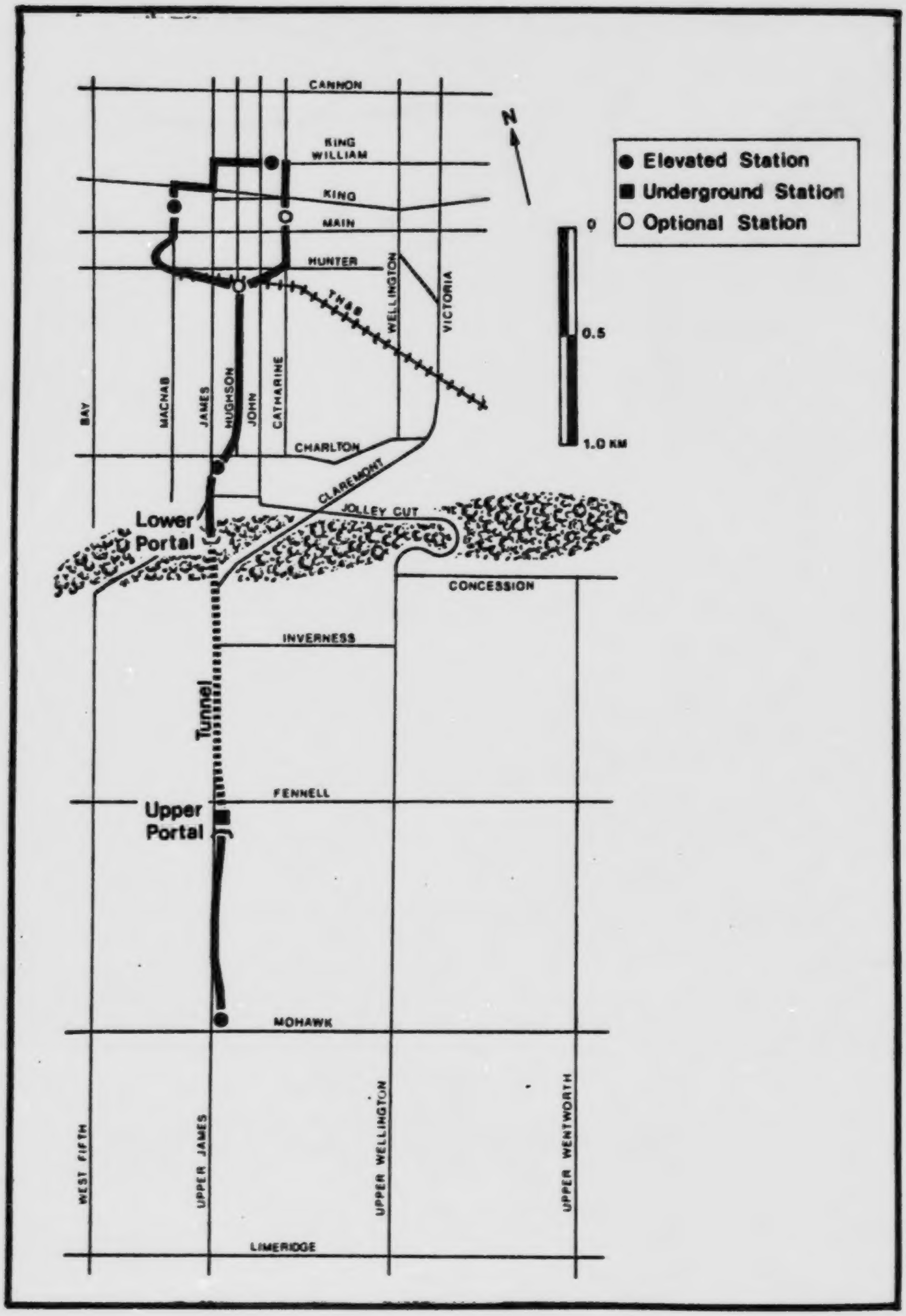
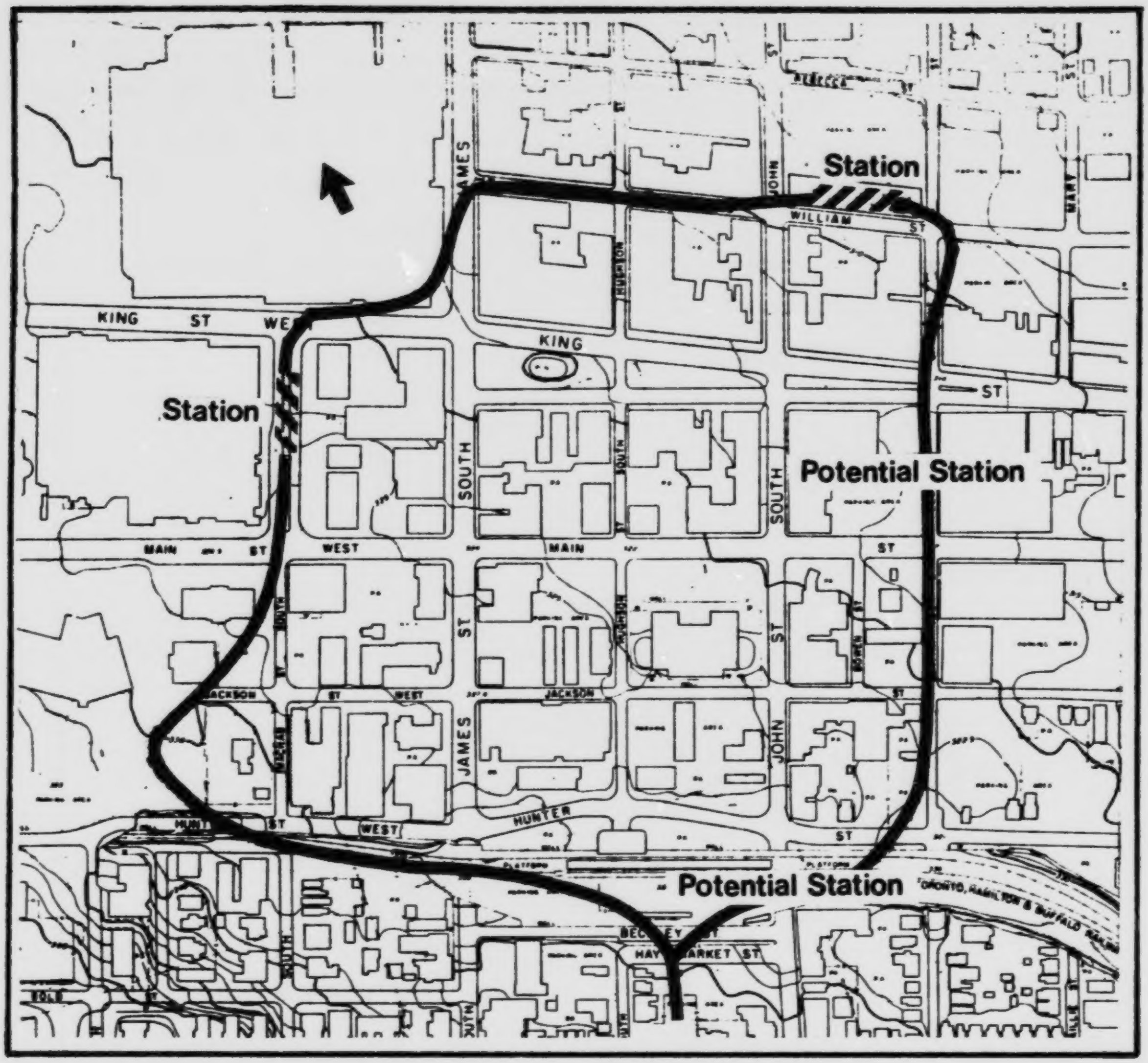
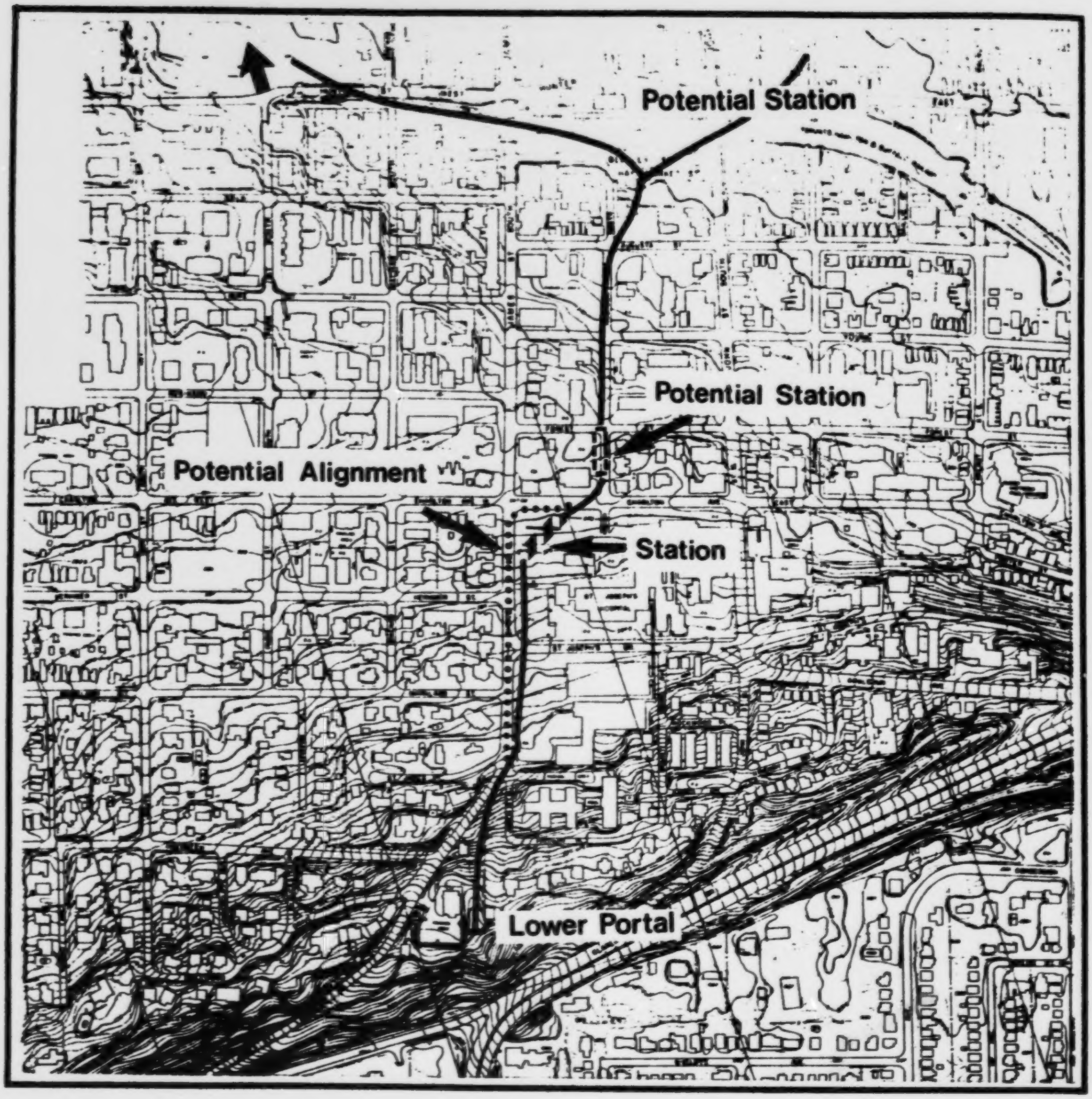

CANNON
KING WILLIAM
KING
MAIN
HUNTER
TH&B
N
● Elevated Station
■ Underground Station
○ Optional Station
0
0.5
1.0 KM
BAY
MACNAB
JAMES
HUGHSON
JOHN
CATHARINE
WELLINGTON
VICTORIA
CHARLTON
CLAREMONT
JOLLEY CUT
Lower Portal
CONCESSION
INVERNESS
Tunnel
FENNELL
Upper Portal
MOHAWK
WEST FIFTH
UPPER JAMES
UPPER WELLINGTON
UPPER WENTWORTH
LIMERIDGE

Figure 1.5.1 Downtown Loop


Station
Station
Potential Station
Potential Station
KING ST WEST
KING ST
MAIN ST WEST
MAIN ST
JAMES
SOUTH JAMES ST
SOUTH JOHN ST
JOHN
WILLIAM ST
REBECCA ST
MARY
HUGHSON
SOUTH HUGHSON
JACKSON ST WEST
JACKSON
HUNTER ST WEST
HUNTER ST
BOWEN ST
MACNAB
HAYMARKET ST
TORONTO, HAMILTON & BUFFALO RAILWAY

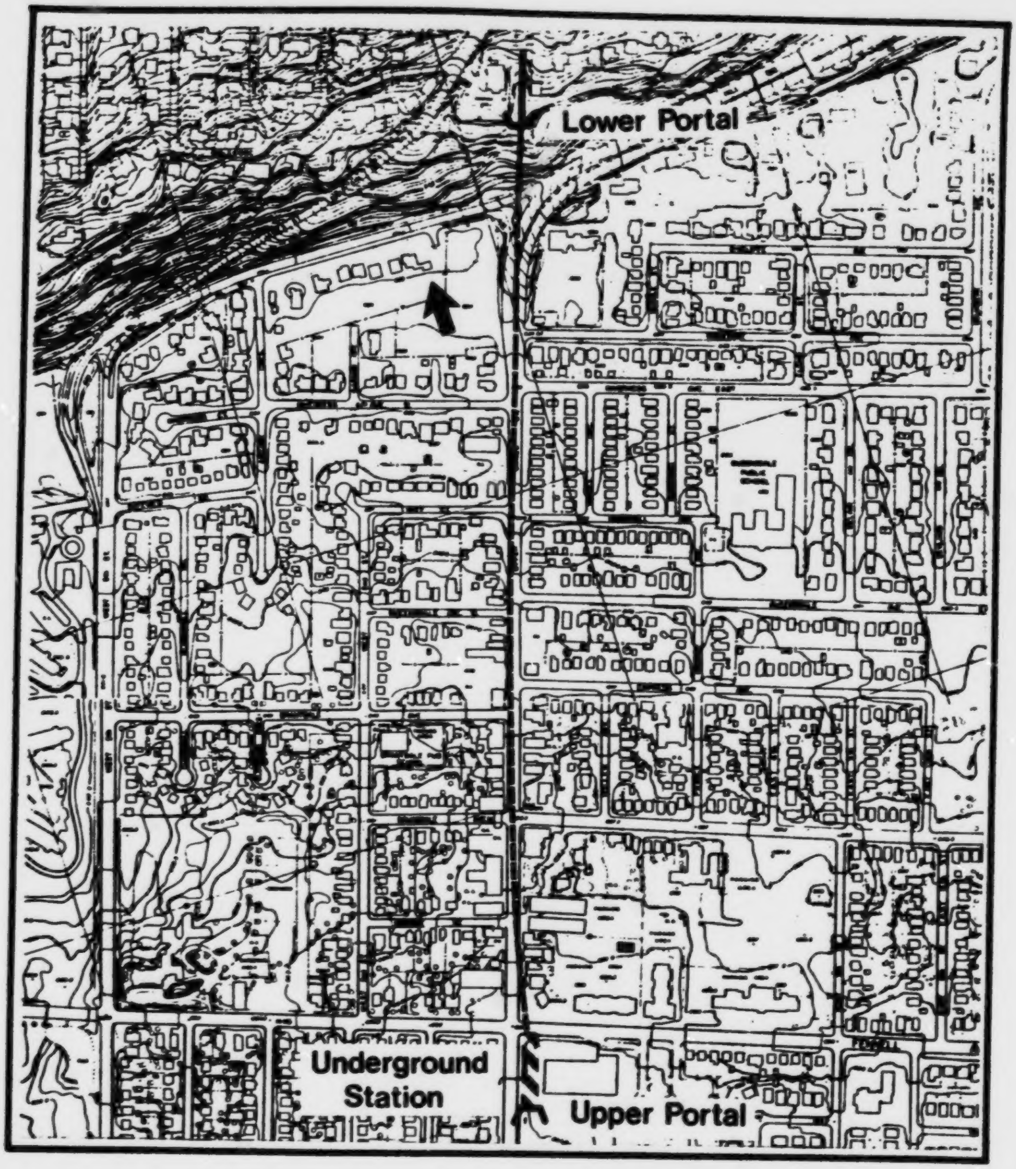
Route Segment	Type of Construction	From	To	Along	Approximate Distance	Station Location
Downtown Loop	Single Track Elevated Guideway	TH&B Station	Catharine Street	TH&B Railway	0.25 KM	TH&B Railway (Optional)
	Single Track Elevated Guideway	TH&B Railway	King William Street	Catharine Street	0.48	Between Main Street and King Street (Optional)
	Single Track Elevated Guideway	Catharine Street	James Street	King William Street	0.34	Between Catharine Street and John Street
	Single Track Elevated Guideway	King William Street	King Street	James Street	0.13	-
	Single Track Elevated Guideway	James Street	MacNab Street	King Street	0.19	-
	Single Track Elevated Guideway	King Street	TH&B Railway	MacNab Street with intervening looped section	0.36	Between King Street and Main Street
	Single Track Elevated Guideway	West of MacNab Street	TH&B Station	TH&B Railway	0.41	-

Figure 1.5.2 Lower Plateau


Potential Station
Potential Station
Potential Alignment
Station
Lower Portal

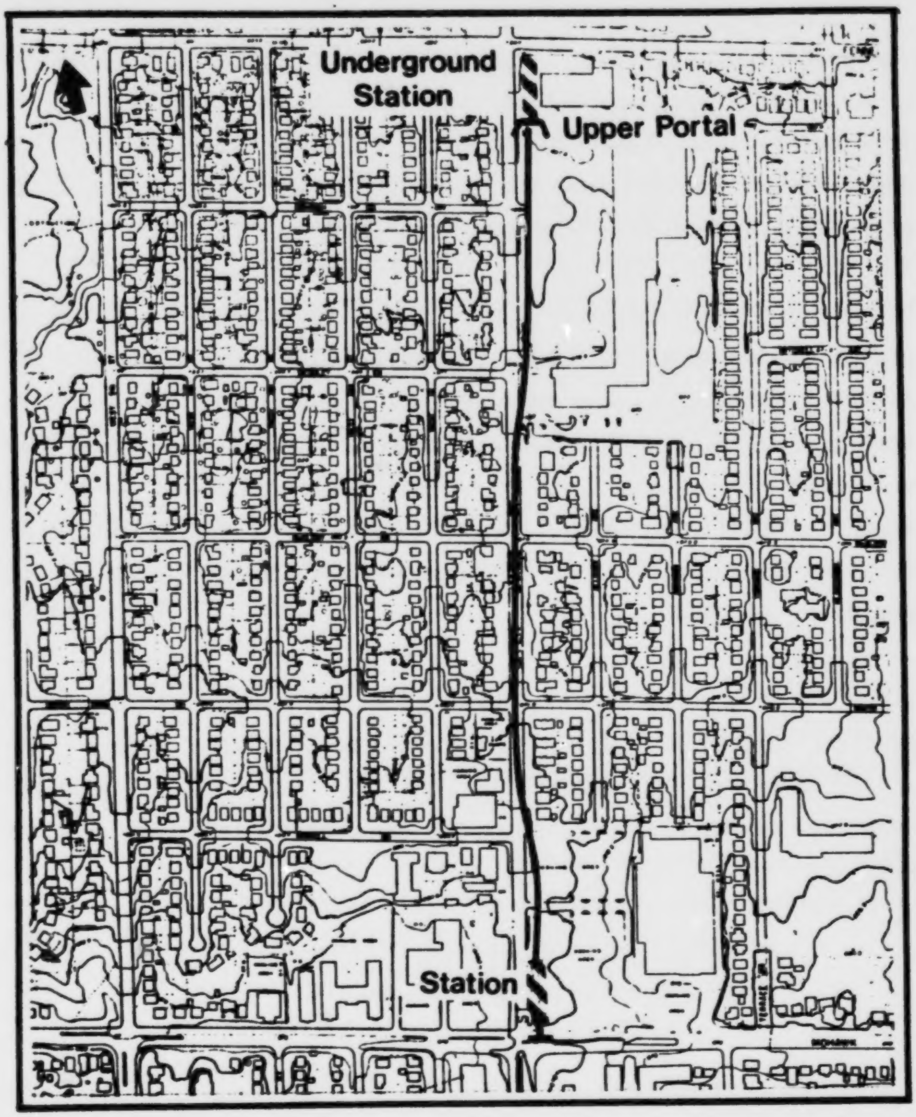
Route Segment	Type of Construction	From	To	Along	Approximate Distance	Station Location
Lower Plateau	Dual Track Elevated Guideway	TH&B Railway	Lower Portal	Hughson Street and James Street	1.24 KM	Diagonally at James Street South and Charlton Ave. E.

Figure 1.5.3 Tunnel


Lower Portal
Underground
Station
Upper Portal

Route Segment	Type of Construction	From	To	Along	Approximate Distance	Station Location
Tunnel	Dual Track Tunnel	Lower Portal	Upper Portal	Old Incline Railway & Upper James Street Alignment	1.37 KM	Upper James Street, south of Fennell Ave. (Underground Station)

Figure 1.5.4 Upper Plateau


Underground
Station
Upper Portal
Station

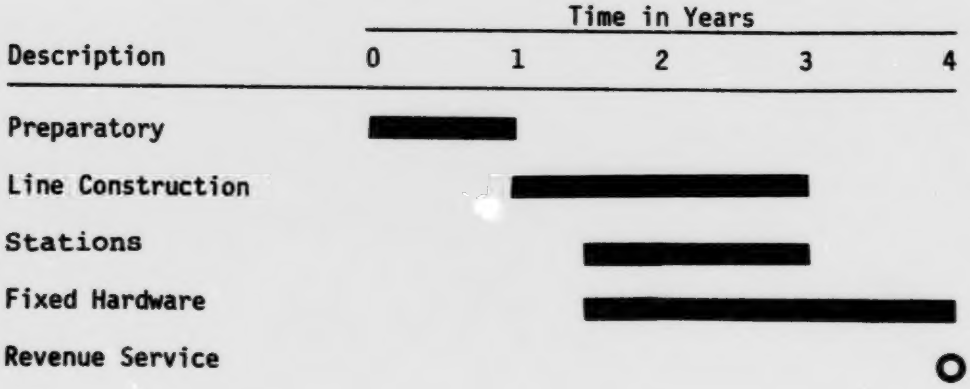
Route Segment	Type of Construction	From	To	Along	Approximate Distance	Station Location
Upper Plateau	Dual Track Elevated Guideway	Upper Portal	Mohawk Road	Upper James Street	0.82 KM	Upper James Street at Mohawk Road

transportation service, technology demonstration and energy conservation. Transportation service, in this case, is largely dictated by the capacity of the existing road system and the capability of conventional bus transit system to accommodate expected future travel demand in the study corridor.

It is generally agreed that an alternative to a road-based transportation network, such as ICTS, should be implemented prior to serious congestion of the road system. Expansion of the existing road network across the Niagara Escarpment within the Study Area is restricted by Regional policy in the Region's Official Plan (1980). Based on available projections for growth in travel demand in the Mountain Corridor,(4) traffic congestion could become a serious problem after 1990.

According to current estimates, project implementation of ICTS would require four to five years to complete from the time of Regional Council approval, as shown in Figure 1.6. As a result, the earliest operational date for ICTS, assuming approval in 1982, would be 1986 or 1987.

Figure 1.6
Design and Construction Schedule(5)



1.3 Purpose of the Undertaking

The three principal purposes of the undertaking are 1) to provide an Intermediate Capacity Rapid Transit System for the Regional Municipality of Hamilton-Wentworth to link the central mountain area to downtown, 2) demonstrate ICTS technology in a revenue service application, and 3) support the development objectives of the Regional Municipality of Hamilton-Wentworth.

1.4 Description of the Alternatives to the Undertaking

To be completed and added after review by Regional staff.

1.5 Rationale for the Undertaking(8,11)

1.5.1 - THE NEED FOR RAPID TRANSIT

1.5.1.1 - The Need for Rapid Transit in Hamilton and the Region(6,7,8)

In the 1960's, traffic congestion became so severe on the Central Mountain access roads that the City of Hamilton had to construct the Claremont Access Road. The opening of the Claremont in the early 1970's temporarily relieved traffic congestion on these Central Mountain roads. However, in order to take advantage of this new link, a number of other projects have to be undertaken. Most notable of these is a major widening of Upper James Street north of Fennell Avenue.

Other Mountain Access Roads are now under pressure to be widened, such as Beckett Drive with the complementary widenings of Queen Street and Hess Street. As planned population growth on the Mountain and Downtown occurs, vehicular traffic on the Mountain accesses will increase. Unless some form of remedial measure, such as rapid transit or new widened access roads are provided, severe traffic congestion is again anticipated, reaching a stop-and-go situation in the 1990's.

Regional Council and the City of Hamilton have stated, as strong planning and environmental policies, that the travel demand deficiencies will not be met by the widening of roadways for automobiles. The travel demand must be met by increased capacity within the public transit modes.

A number of studies by the City of Hamilton and the Regional Municipality of Hamilton-Wentworth have led to the selection of the Central Mountain Corridor as the first priority corridor requiring rapid transit service. The following list of background studies provides the history behind the decision by the Region to conduct a Pre-Implementation Feasibility Study of the Intermediate Capacity Transit System (ICTS) technology as part of their overall planning strategy.

Transit Studies Summary: 1969 - 1980

1969	- Hamilton Transit Planning Committee recognized future need for all-weather rapid transit link between Mountain and Downtown.
1970	- Hamilton Transit Commission confirmed the physical feasibility to construct all forms of rapid transit in Hamilton.
1973	- City of Hamilton reported on transportation strategies, including the potential to link downtown to the Mountain with an intermediate capacity transit system.
1976	- Transportation Development Agency (Canada) reported that the Hamilton Mountain Corridor has the highest potential demand for rapid transit in Hamilton.
1976	- City of Hamilton, Transit Commission and Region identified the Mountain to Downtown as the priority transit corridor.
1980	- Region's Official Plan stated high priority for rapid transit in the Mountain Corridor.
1980	- City's Official Plan (draft) supported transit objectives of the Region.

In 1980, the Technical Advisory Committee reconfirmed the Central Mountain Corridor as the priority corridor for rapid transit.

The Regional Official Plan also recognizes the need for a higher capacity transit line and states the following in Section 9.3.8, (Pg 77):

> "In order to accommodate large volumes of transit users, make transit service competitive with the private auto and minimize the need for new road facilities in congested corridors and across environmentally sensitive areas. A transit system with increased transit capacity, will receive a high priority in transportation planning to the urban areas of the Region, especially in the corridor connecting downtown Hamilton to the sub-regional centre on the Hamilton Mountain."

The transportation need for the transit line as defined by the Region at the beginning of the study is based on:

- forecasted total transit ridership for the corridor of 8 000 persons travelling in the peak direction in the peak hour by the year 2001; (The impact of recently released revised population projection upon regional growth and transportation characteristics are being reviewed by the Region. The new growth estimates were not available for this report.)

- forecasted deficiencies in road capacity crossing the escarpment in the range of 4 600 vehicles in the peak direction in the peak hour;

- complimentary policies in the Official Plan that limit the expansion of road capacity crossing the escarpment to minor improvements to the existing accesses and the construction of the now planned north-south roadway corridor in Hamilton;

- the desire to minimize the impact on the Niagara Escarpment caused by the construction of new transportation facilities.

The future development of a higher capacity transit line in this corridor has been taken into consideration in the development of plans for other components of the transportation system. The analysis revealed the need for alternative alignments to the north-south roadway network based on a high modal split travel demand compatible with the development of a high speed exclusive right-of-way transit line operating between the mountain and downtown Hamilton.

The Mountain Corridor was identified as the spine of a rapid transit system that would also serve the needs of the industrial core and future east-west transportation needs.

1.5.1.2 - Hamilton-Wentworth Pre-Implementation Rapid Transit Study

Given the high priority and need for rapid transit, the Regional Municipality of Hamilton-Wentworth, in August 1980, entered into a contract with Metro Canada Limited to undertake a study of a proposed rapid transit service linking the Downtown core with the Central Mountain. Metro Canada Limited, as prime consultants, hired a number of sub-consultants having special expertise in engineering, planning and environmental disciplines to investigate and report on specific aspects of the study.

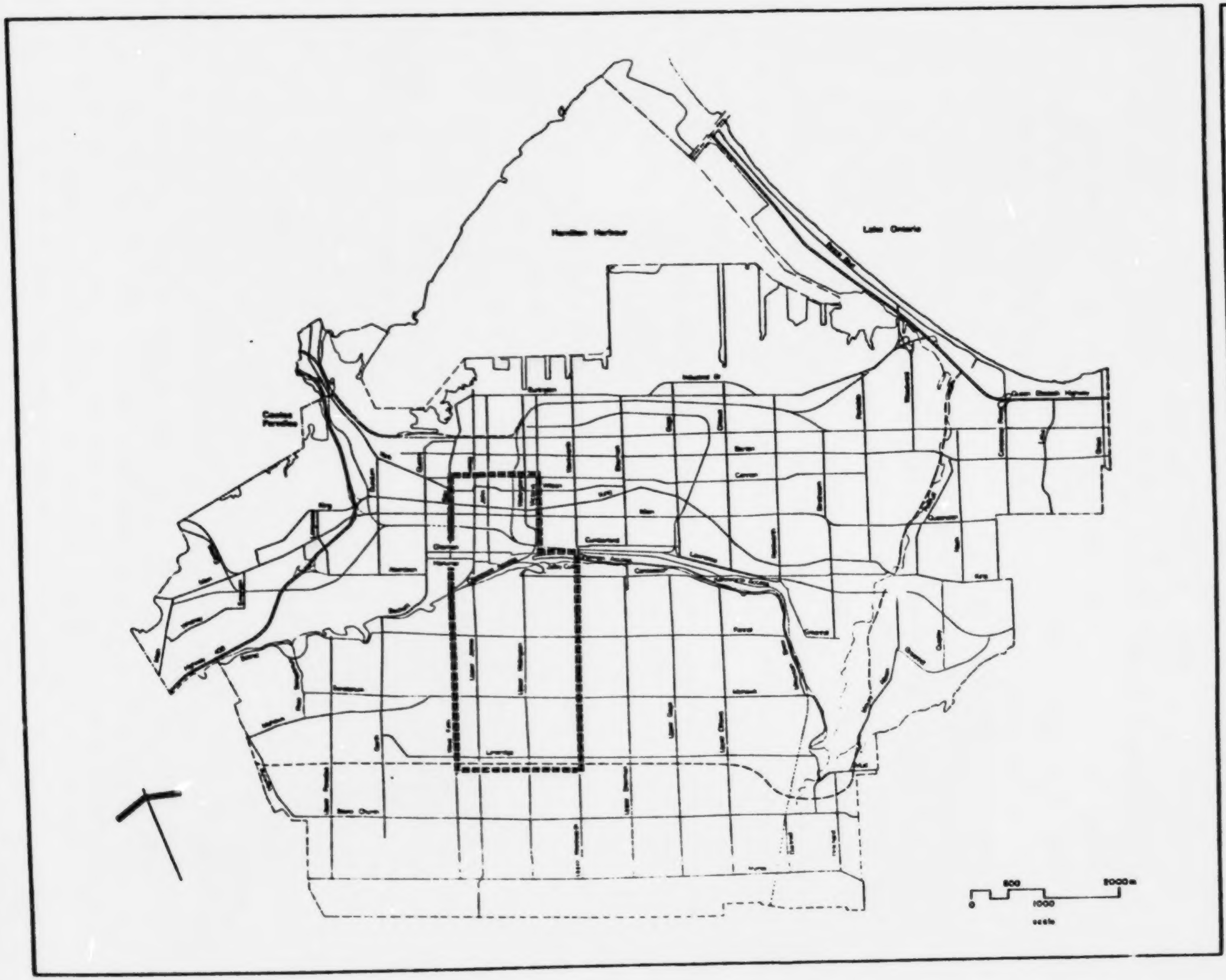
1.5.1.3 - Study Area Boundary

As part of the Pre-Implementation Study, a proposed rapid transit route was selected by the Region following consideration of a number of alternative alignments within a study corridor which was defined by the Region. The limits of this corridor are illustrated in Figure 1.7, and are described as follows:(8)

a) Within the lower City area, the corridor boundaries include Bay Street, Cannon Street and Victoria Avenue.

   This area encompasses the major downtown office, commercial, and retail activity centres. All downtown bus routes pass through this area with transfers between most routes occurring at Gore Park, the centre of the area. The TH&B Railway station and the Bus Terminal are within the boundaries. Potential sites for a new inter-city bus terminal are also included in this area.

b) On the Mountain, the study corridor is bounded by Upper Wentworth Street, West 5th Street and the proposed east-west expressway alignment just south of Limeridge Road. The corridor includes


Hamilton Harbour
Lake Ontario
Queen Elizabeth Highway
Cootes Paradise
Barton
Cannon
Main
King
Cumberland
Fennell
Mohawk
0
500
1000
2000m
scale

Study Corridor

■■■■■ Study Corridor Boundary

metro canada limited

HAMILTON-WENTWORTH
RAPID TRANSIT STUDY

FIGURE 1.7 CORRIDOR

the new developing Regional Sub-Centre (which is a possible future terminus for ICTS) and the major arterial roads which are potential candidate rights-of-way for rapid transit alignments in the corridor. The corridor comprises primarily residential development and includes vacant areas with potential for new development.

1.5.1.4 - International and Canadian Needs - The Canadian Urban Transit Industry

The Canadian urban transit equipment industry has the potential to become a world leader in the supply of transit equipment and systems. As described in the 1978 Department of Industry Trade and Commerce (DITC) discussion paper, The Urban Transportation Equipment Industry in Canada, the development of the industry has occurred largely in the last decade, and has been based on:

- domestic and foreign market opportunities
- provincial initiatives
- expressed federal interest

Research and development during this period, oriented both to full systems and to sub-systems and components, have provided Canada with a position in transit systems development and a world lead in some product areas. The recent industry history is that most of the successful international transit component programs have evolved as part of larger system developments. It is now becoming clear that advances in both components and in full systems in future years will be, for the most part, derived from major systems development programs.

In its report, the Department of Industry, Trade and Commerce finds that:

> "the potential for further development of the Canadian urban transportation systems and equipment capability is excellent ... but (the industry's commercial) success is dependent upon its ability to penetrate the domestic market and thus demonstrate its systems capability in revenue service. The importance of a systems capability and the demonstration of that capability in the domestic market cannot be over-emphasized. Without it, the companies now forming the Canadian industry sector must inevitably reduce their activity to exploitation of domestic market opportunities under foreign licence. With it, the Canadian share of the world market can continue to increase. It is essential that domestic governments, Provincial and Federal, as the only customers for transit equipment and as the primary benefactors of transit technology advances, provide the research facilities, demonstration capability, and financial climate necessary for the transit industry to achieve this full technical and industrial potential."

An important component of the demonstration phase of the ICTS Development Program is the creation of a Canadian Industrial Team possessing all of the skills and expertise required to produce high technology transit systems for the domestic and international markets. One of the objectives of the ICTS Development Program is to involve as many Canadian suppliers and sub-contractors as possible, in order to maximize industrial participation in the program and to develop a strong and internationally competitive industrial base. The record of the Urban Transportation Development Corporation Ltd. (UTDC) during recent years shows that approximately 95% of all its expenditures have been sub-contracted, and that hundreds of firms across Canada have participated commercially in UTDC programs such as ICTS. This group of companies illustrates the Industrial Team concept and represents the core of a potential demonstration system implementation team. Metro Canada Limited is the company established by UTDC to represent the Industrial Team for ICTS implementations, including the ICTS project in Hamilton in the event that Regional Council decides to proceed with system construction.

1.5.1.5 - History and Development of ICTS Technology

In 1975, the Province of Ontario embarked on the Intermediate Capacity Transit System (ICTS) development program. Under the auspices of the Ontario Ministry of Transportation and Communications (MTC), the Urban Transportation Development Corporation (UTDC) was given a mandate to develop, test, produce and market an advanced technology Intermediate Capacity Transit System. The primary objective of this program was to develop an urban transit system for medium-sized cities which would have substantially lower capital and operating costs than alternative transit systems, while stressing Canadian technology.

The ICTS program was subsequently divided into five phases:

Phase 1 - Data Acquisition and Program Definition
Phase 2 - Concept Development and Preliminary System Design
Phase 3 - Prototype System Development and Testing
Phase 4 - Production Development and Testing
Phase 5 - Revenue Production

Phases 1 and 2 involved the development of operational design requirments for ICTS in consultation with local municipalities and major transit operators. In turn, specifications and design criteria for the ICTS were subsequently generated to meet these requirements.

Under Phase 3 of the program, a prototype ICTS was developed and refined at the Transit Development Centre near Kingston, Ontario. Major tasks included: the development and testing of suspension, propulsion, braking, command and control systems, and the integration of sub-systems to form an ICTS prototype. Since August 1978, the prototype ICTS has been undergoing refinements through testing. By 1980, there was a desired need to show the prototype system working in a passenger carrying demonstration mode. As such, the UTDC formed Metro Canada Limited, a wholly owned subsidiary company, to undertake the implementation and delivery of all ICTS projects.

The purpose of Phase 4 is to transform the prototype hardware into commercial product. The orientation of the program has shifted from research and development to production: from prototype system construction and testing to fabrication of fully operational revenue-class and operating system elements. The final objective of Phase 4, is the transfer of state-of-the-art advances in transit system technology to the Canadian urban transit industry.

Phase 5 of the program involves participation in the urban transit industry and the production of revenue service transit systems for both domestic and export markets to meet the standards and criteria in performance, design, operation, and noise emission as identified under Phases 1 and 2 of the program.

1.5.1.6 - Demonstration Location

As an integral part of its ICTS technology development program, UTDC has undertaken a series of potential application studies. Several such studies were undertaken in Hamilton. For instance, a 1975 study, Hamilton Rapid Transit Network - A Discussion of Potential ICTS Routes in Hamilton investigated the potential of ICTS in Hamilton and the design features that would have to be incorporated in such a system to satisfy not only the transit requirements, but also the unique geographic feature of the City.

In 1976, the UTDC/ICTS Urban Design Study examined the compatability of an elevated ICTS within various typical urban settings and the identified operational capacities and initiatives which could improve the urban integration of the system.

The third UTDC study pertaining to Hamilton, ICTS Urban Design - Case One/Two, completed in 1977, identified and compared the differences between the application of ICTS and a Light Rail Transit System (LRTS) in the same environment and developed an approach for the design of an elevated ICTS system in representative urban environments.

The purpose of these studies was to test the ICTS system capabilities against the real-life operational requirements of transit system scenarios developed on the basis of Canadian municipalities' assessments of their future transportation needs and plans. The findings of the applications studies were used as a continuous check on the ICTS technology design to ensure that technical definition conformed to real market needs and opportunities.

The studies revealed that the ICTS system was appropriate in a number of applications. In particular, in Ontario, the studies proved that ICTS was especially suited to the application in Hamilton's Mountain Corridor because of its size, character and unique topography. To this end, the Mountain Corridor offers the unique opportunity to demonstrate the capability of the ICTS technology by providing transit service across a formidable topographic barrier, the Niagara Escarpment, in the midst of an urban environment. This corridor also includes a full range of urban development conditions which constitute a variety of constraints and opportunities which are conducive to the design of ICTS. These include:

Central Business District	- large scale urban development - major traffic arteries - limited right-of-way widths - railway crossing - potential route in railway corridors - requirements for interface with surface bus routes - potential for integration with existing and proposed development
Escarpment	- prolonged sections at steep grades - limited route alternatives and right-of-way - possible tunnel sections and stations - difficult geotechnical conditions - environmentally sensitive areas
Mountain (above escarpment)	- low density residential development - some sections of strip commercial and highway commercial development - shopping centre opportunities - limited areas of high density development - limited arterial road rights-of-way - requirement for provision of feeder bus and auto kiss 'n ride interface - potential for provision of commuter parking

1.5.2 - TECHNOLOGY DEMONSTRATION

The Mountain corridor offers a unique opportunity to demonstrate the capability of Intermediate Capacity Transit System (ICTS) technology to provide service across a formidable topographic barrier, the Niagara Escarpment, in a corridor which encompasses a full range of urban development conditions including city centre and suburban development. A Hamilton-Wentworth system would also provide an excellent opportunity to demonstrate the use of steel as the primary guideway structural material.

- The ICTS technology provides an opportunity to reduce dependence on the private automobile and fossil fuels, to reduce transportation pollution levels, and to stimulate higher density, more energy-efficient residential development.

- Federal government studies have concluded that the future development of the Canadian transit industry is dependent on development of systems and demonstrations of technology in revenue service.

- The Urban Transportation Development Corporation (UTDC) has developed an ICTS technology which has reached the stage where commercial application is underway.

- The purpose of the revenue demonstration includes:

  - demonstration of technology and operational capability

  - advancement of prototype designs and tooling

  - provision of tooling and facilities for production

  - development of an advanced competitive industrial team in Canada's private sector, capable of worldwide export of transit systems.

  - establishment of operational testing and manufacturing competence for revenue service.

- Revenue demonstration operations of ICTS technology will constitute the principal marketing tool for penetration of worldwide markets for ICTS.

1.5.3 - REGIONAL DEVELOPMENT STRATEGY AND RAPID TRANSIT (Figure 1.8)

Regional Employment Goals

The Region is investing in the roads and sewer services which are necessary to attract industrial investment. Development of services to 4 000 acres of new industrial parks is provided for in the 1981 - 1985 public works program. Eighty percent of future job growth targeted in the Region is in the commercial and institutional services sector. Approximately 37 000 of these jobs (35% of the total) have been designated for location in the Downtown Central Business District to provide a central focus for business activity. This will support a higher quality public transportation service.

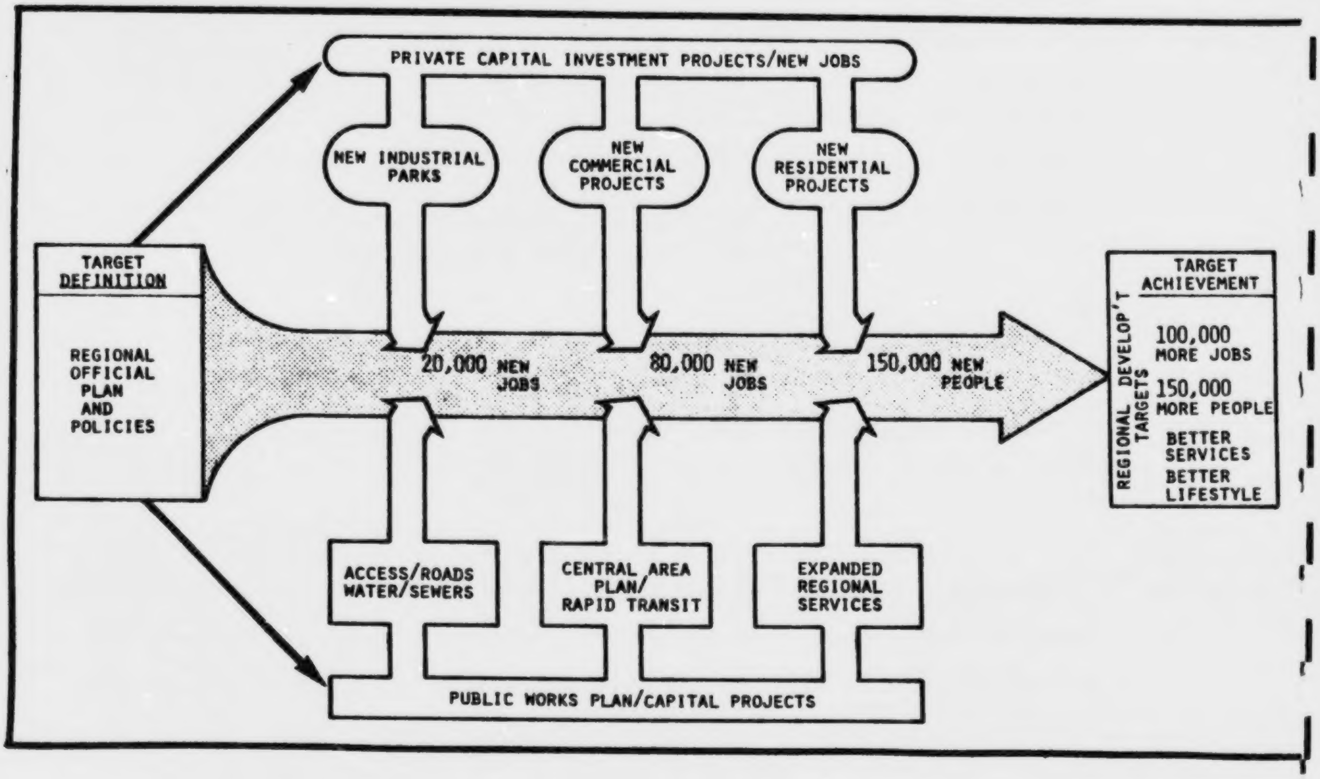
To date, only a small fraction of the commercial space permitted in the Central Business District has been constructed, despite the municipal commitment in 1970 to an extensive Civic Square Re-development Project.

The new Central Area Plan emphasizes a new image for the downtown, including a Plus 15 pedestrian concept. In addition, activity regarding the arena, and commercial projects in the downtown are the principal current efforts to stimulate commercial interest in the downtown.

Employment Generated By ICTS

If ICTS were constructed, it is estimated that total employment due to capital expenditures will be approximately 2 400 person-years. Total direct employment in Hamilton-Wentworth would be about 1 418 person-years, representing 87% of the total direct employment on the project. Most of this employment, about 1 254 person-years, would be in the construction trades, with another 154 person-years in engineering and architecture and project administration. Total employment in the construction industry in Hamilton currently ranges between 4 500 and 5 000 persons. The ICTS project, therefore, has the potential to increase construction employment by about 10%.

FIGURE 1.8 REGIONAL DEVELOPMENT STRATEGY


PRIVATE CAPITAL INVESTMENT PROJECTS/NEW JOBS
NEW INDUSTRIAL PARKS
NEW COMMERCIAL PROJECTS
NEW RESIDENTIAL PROJECTS
TARGET DEFINITION
REGIONAL OFFICIAL PLAN AND POLICIES
20,000 NEW JOBS
80,000 NEW JOBS
150,000 NEW PEOPLE
TARGET ACHIEVEMENT
REGIONAL DEVELOP'T TARGETS
100,000 MORE JOBS
150,000 MORE PEOPLE
BETTER SERVICES
BETTER LIFESTYLE
ACCESS/ROADS WATER/SEWERS
CENTRAL AREA PLAN/ RAPID TRANSIT
EXPANDED REGIONAL SERVICES
PUBLIC WORKS PLAN/CAPITAL PROJECTS

Furthermore, it is estimated that 375-642 indirect person-years of employment would be created in the region. Similarly, direct employment elsewhere in Ontario would be 186 person-years and indirect employment would be between 112 and 194 person-years. A total of 2 235 - 2 674 person-years of direct and indirect employment are estimated for this project.

The ICTS would also increase transit system employment by 22-42 jobs, depending on the ICTS mode of operation. This would result in an increase of $646 000 to $1 129 000 in local wages and salaries.

Potential Benefits to ICTS System

On the basis of land use and development objectives alone, an "early" implementation of ICTS has many advantages to the Region and the City. Such a system is clearly supported by the objectives of the Official Plans of both the Region and City.

The potential benefits of the revenue demonstration project to the City and Region can be summarized as follows:

1. The early construction of a fixed facility of this magnitude in downtown Hamilton would exhibit public sector confidence in the downtown's ability to attract new office development at a time when it is needed. It would also spur other activities and actions to promote and improve the appearance of the downtown area.

2. Early construction would provide a strong transit-oriented development option for the Mountain Corridor and downtown area. This option could generate substantial benefits to the Region in terms of achieving many of its development policies and in producing a more efficient development form for the Region.

3. A commitment to the early construction of ICTS would facilitate decision-making activities for the location of the proposed new inter-regional GO Transit bus terminal downtown as well as supporting the locations of the arena and proposed stadium. It could also improve opportunities to find the necessary financial support for these facilities.

An early completion of the project is critical if the Federal and Provincial objectives of having a demonstration of the ICTS technology in revenue service are to be achieved.

- Early implementation would help attract major commercial projects by reducing the risk to private capital investors of decisions about future downtown transportation service investments.
- Early implementation would provide a strong transit-oriented urban development option (Central Business District focus and higher-density residential development) and thus would help achieve many of the Region's development goals.
- Early implementation would protect the Region's existing public capital investments for future industrial and commercial development. This would help provide the essential public service investment needed to support economic development in the Central Area and Mountain Corridor.
- Early implementation would offer better transit services sooner for people who want or do not have an alternative to the automobile. This demand towards transit may shift faster than originally projected with the recent agreement on energy pricing between Ottawa and Alberta. The estimated price of gasoline in 1986 is $4.00/gallon. 1986 is also the earliest year for project implementation.
- Early implementation would provide better transit services throughout the Region such as improved connections to GO Transit at the future Inter-Regional Bus Terminal.
- Early implementation - as a Rapid Transit Demonstration Project for Canadian transit technology - before mature transit ridership demands are realized means more advantageous capital and operating cost-sharing agreements may be attained than could otherwise be expected.

- Later implementation of a rapid transit service will have substantially fewer benefits, primarily because the location and densities of developments and re-developments will have been influenced by existing road and transit patterns. The risk of failure to achieve an acceptable economic return from the public investment in a delayed rapid transit project will be substantial.

From an energy perspective, early implementation will achieve a lessening of dependence on fossil fuels at an earlier date. Furthermore, the innovative technology and the improved service provided by an exclusive right-of-way system has the potential to increase transit ridership and promote transit usage patterns.

2.0

PROJECT APPROACH

2. PROJECT APPROACH

2.1 Environmental Assessment Process - Background

In August 1980, Metro Canada Ltd. was hired by the Regional Municipality of Hamilton-Wentworth to be the prime consultant on the Hamilton-Wentworth Rapid Transit Pre-Implementation Study. Under the terms of agreement, Metro Canada Ltd. was to structure the study to meet the requirements of the Ontario Environmental Assessment Act, 1975. To this end, the Pre-Implementation Study was organized to include eleven major tasks which are summarized below:

1. Development of a System Operating Requirement Report

This task involves the preparation of a System Operating Requirement Report defining how the system will operate in the Hamilton-Wentworth Rapid Transit System.

2. Development of a Preliminary Design Standards Manual

This task involves the preparation of geometric, building, safety and security standards for use in the preliminary design of the Hamilton-Wentworth Rapid Transit System. These standards will be recorded in the Preliminary Design Standards Manual.

3. Rapid Transit Rationale

The purpose of the rapid transit rationale is to review and document the basis for determining the corridor, purpose and implementation timing of the Hamilton-Wentworth Rapid Transit System.

4. Comparison of Alternative Modes

This task will demonstrate the ability of the ICTS system to meet the requirements of the System Requirements Document and the Preliminary Design Standards Manual and will compare the performance of ICTS with other proven and available transit modes.

5. Generation of Feasible Alignment Alternatives

This task will identify alternative alignments for the rapid transit system, eliminating from further consideration any alignments that are not feasible, viable or practical.

6. Analysis of Feasible Alignment Alternatives

This task will analyse the set of feasible alignments generated in the previous task and provide the results of this analysis to the evaluation team for the purpose of synthesizing the analysis for use by MCL in selecting a recommended shortlist of the most promising alignment alternatives.

7. Detailing of Shortlisted Alignment Alternatives

Once a shortlist of the most promising alignment alternatives has been approved by the Region, this shortlist will be analysed in greater detail and the results of this detailed analysis will again be provided to the evaluation team for the purpose of selecting a recommended alignment.

8. Evaluation of Alignment Alternatives

The evaluation task will:

- review and clarify system objectives;
- develop a method and set of criteria for alignment evaluation;
- evaluate the set of feasible alignment alternatives, based on the analysis described above, leading to a recommendation to the Technical Committee of a shortlist of alignment alternatives to be considered for more detailed analysis and evaluation; and

- evaluate the shortlist of alignment alternatives, based on the detailed analysis described above, leading to the recommendation to the Technical Committee of a preferred alignment for the Rapid Transit System.

9. Preliminary System Description (Functional Plan)

Once a preferred alignment has been recommended to, and approved by the Region, a functional plan of that alignment will be prepared. This functional plan will describe the approved alignment to a level of detail suitable for use as the basis for detailed design.

10. Public Participation Program

The purpose of the public participation program is to increase public awareness of the Study, to provide information from the public on a continuing basis to planners and designers and to provide an opportunity for the public to influence the planning and design of the system.

11. Environmental Assessment and Draft Application

This task will prepare draft analysis and documentation required in order to make an application for project approval under the Environmental Assessment Act, 1975 of Ontario.

2.2 Study Team Composition

The environmental review process is to be co-ordinated by a highly qualified group consisting of local councillors, government-appointed officials and consultants. Each group represents a wide variety of professional backgrounds.

In initiating the Pre-Implementation Study, Regional Council appointed a Steering Committee, a Technical Advisory Committee and Project Co-ordinator to oversee the project (Figure 2.1).

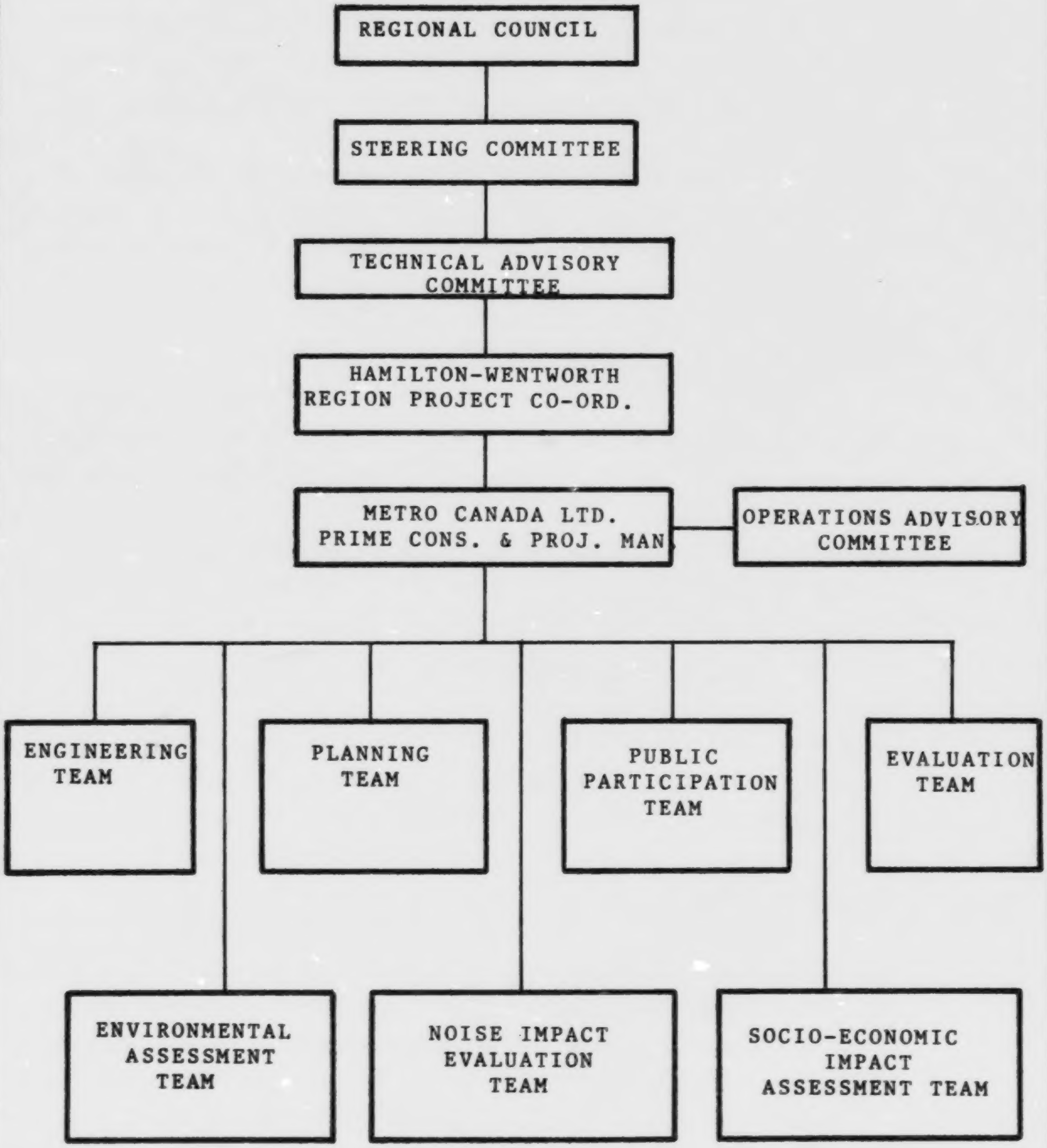

REGIONAL COUNCIL
STEERING COMMITTEE
TECHNICAL ADVISORY COMMITTEE
HAMILTON-WENTWORTH REGION PROJECT CO-ORD.
METRO CANADA LTD. PRIME CONS. & PROJ. MAN
OPERATIONS ADVISORY COMMITTEE
ENGINEERING TEAM
PLANNING TEAM
PUBLIC PARTICIPATION TEAM
EVALUATION TEAM
ENVIRONMENTAL ASSESSMENT TEAM
NOISE IMPACT EVALUATION TEAM
SOCIO-ECONOMIC IMPACT ASSESSMENT TEAM

FIGURE 2.1 STUDY TEAM STRUCTURE

In addition, Metro Canada Ltd. tendered for sub-consultants to complete various task assignments. The assembled team of sub-consultants consisted of:

a) UTDC/MCL Technical Team
b) Engineering Team
c) Planning Team
d) Environmental Assessment Team
e) Public Participation Team
f) Evaluation Team
g) Noise Impact Evaluation Team
h) Socio-Economic Impact Assessment Team

Table 2.1 lists the participants and primary responsibilities for each member of the project team.

2.3 Study Procedure

The environmental review process followed five distinct phases; namely, a) data review, synthesis and inventory, b) alternatives generation and evaluation, c) selection, d) social impact survey, and e) an economic impact assessment.

A summary review of each stage follows:

2.3.1 - DATA REVIEW, SYNTHESIS AND INVENTORY

During this stage, each team member compiled relevant information pertaining to the proposed undertaking and the study area. The primary data sources included available reports, maps and briefs published by various government sources. The data base index is presented in Appendix 1. During the review of this information, supplementary programs of data collection were initiated. (It should be noted that there are known data base deficiencies which can be completed during the design phase.) A detailed review of existing environmental conditions examined to date is presented in Chapter 4.

TABLE 2.1

ICTS Pre-Implementation Program

Study Team Composition

2. A Regional Municipality of Hamilton-Wentworth

o Regional Council	
o ICTS Rapid Transit Steering Committee	o nine members of Regional Council o one representative of the Ministry of Transportation and Communications
o Technical Advisory Committee	o staff representatives from: Regional Co-ordinators Office Regional Rapid Transit Office Regional Engineering Department Regional Planning and Development Department Hamilton Street Railway City Traffic Department Ministry of Transportation and Communications Toronto Area Transit Operating Authority (non-voting member) Operations Advisory Committee (observer) Federal Ministry of Industry Trade and Commerce (non-voting member)

2. B Consultants

- Prime Consultant
  - Metro Canada Limited
- Sub-Consultants
  - Transportation and Land Use Planning
    Marshall, Macklin, Monaghan Limited
    Hatch Associates Limited
    Barton Myers Associates
  - Environmental Assessment
    Marshall, Macklin, Monaghan Limited
    Hatch Associates Limited
  - Engineering
    Cole Sherman Associates Limited
    The Proctor and Redfern Group
    T. J. Garwood-Jones, Architect
    J. Strasman, Architect
    The Trow Group
    ABAM Limited
  - Evaluation
    M.M. Dillon Limited
  - Public Participation
    Connor Development Services Limited
    Beak Consultants
    B.W. Gillespie and Associates
  - Noise and Vibration
    Wilson, Ihrig Inc.
    Marshall, Macklin, Monaghan Hatch Associates Limited
    Prof. F. Hall, McMaster University

- Socio-Economic Impact Assessment
  Marketing Decision Research
  Prof. F. Jones, McMaster University
  IBI Group

2. C Consultant's Advisory Committees

o Operations Advisory Committee	o senior professionals from Canada's transit industry
o Community Advisory Committee on Rapid Transit	o citizen representatives from various community groups and associations

2.3.2 - ROUTE ALTERNATIVES GENERATION AND SELECTION PROCESS

Based on information provided by the Region, regional committees and sub-consultants, Metro Canada Ltd. generated a number of alternative route alignments. Each alignment was broken down into segments for the purpose of evaluation.

The evaluation process was based on a number of important criteria related to specific transportation, development, planning, environmental and engineering objectives.(9, 10) The segment options were evaluated relative to each other and the options which were not considered as viable or as practical were eliminated from further consideration. From the initial group of candidate alignments, four (4) routes were selected for more detailed study. Details of the various route alignment alternatives are presented in Chapter 3.

2.3.3 - SELECTION

Upon the completion of the evaluation phase of the four routes, Metro Canada Ltd. recommended a preferred route, in consultation with the various sub-consultants. The preferred route was approved for further study by the Regional Council on July 21, 1981.

2.3.4 - SOCIAL IMPACT ASSESSMENT (*)

Following the selection of the preferred rapid transit route, a comprehensive Social Impact Assessment was undertaken.

The primary goal of the Social Impact Assessment was to facilitate decision making by determining the full range of perceived social benefits and disbenefits of the proposed Intermediate Capacity Transit System (ICTS) for Hamilton.

(*) Marketing Decision Research Ltd., "Social Impact Assessment for the Hamilton-Wentworth Rapid Transit Study", October 1981.

In the Hamilton situation, where the proposal to construct an elevated ICTS is the concept under study, it is not possible to study the consequences of establishing such a system except by generalizing from past experience with similar systems elsewhere, or by speculating on what might occur, or by asking those living in the area to speculate on what might occur. The latter aproach was adopted by conducting surveys of the various populations to be impacted.

For the Primary Impact Area (PIA), where it is expected that social impacts might be more pronounced, it was necessary to collect the most accurate and comprehensive data possible. For this reason, it was decided that face-to-face in-home personal interviews would be conducted with residents living directly on the route chosen for further study.

The PIA was defined to inclmde Upper James Street between Fennell Avenue and Mohawk Road in the Upper City and the areas referred to as the "loop" and the "stem" in the Lower City. In total, 88 dwelling units were identified as being directly on the route - 80 dwelling units in the Upper City and 8 dwelling units in the Lower City.

For the Secondary Impact Area (SIA), where the residents' homes are removed one or two blocks from the actual alignment, less extensive information was required. As such, telephone interviews averaging thirty minutes were conducted with this population. Together, the SIA and PIA combine to form the Corridor group which was studied.

In order to measure the perceived impacts in the wider population of the Regional Municipality of Hamilton-Wentworth, twenty minute telephone interviews were conducted with adults age 18 and over. Although it might be argued that adults age 18 might not be taxpayers and that their opinions might not be relevant, it was felt that this age group might be impacted by the proposed ICTS, that this age group might be high users of the present public transit system and that this group merits consideration as well.

It was anticipated that some of the residents in the Region might not be familiar with details relating to the proposed ICTS and, therefore, that the responses might be less than meaningful where the residents were not aware of the proposal. As has been done in other social impact studies, such as for Scarborough, it was decided to mail out information in the form of a fact sheet provided by the Rapid Transit Project Office. In the Scarborough study, pamphlets which outlined the Light Rail Transit concept and provided a map with other information about the project were mailed to each of the households in the study. To avoid concerns of bias in this survey, a study design was adopted which would allow observation of any differences in responses between people who had read the information provided by the Rapid Transit Project Office and people who did not read this information. For the Hamilton-Wentworth survey, one half of all the respondents in the three study groups were randomly selected to be mailed the fact sheets and one half of the respondents were randomly selected to not receive the fact sheets.

With the questionnaires which were administered, information was collected relating to quality of life (QOL), perceptions of community problems, present usage of public transit, anticipated usage of the proposed ICTS, awareness of information provided by the Rapid Transit Project Office, previous exposure to elevated rapid transit systems elsewhere, suggestions for alternative modes of rapid transit for the selected Corridor, concerns of the residents, mitigative measures, and the overall predisposition to be in favour of or opposed to the ICTS proposed for Hamilton.

The major findings of the social impact assessment are outlined in Section 5.2.9 - Perceived Social Impacts.

2.3.5 - ECONOMIC IMPACT ASSESSMENT

In conjunction with the social impact assessment, an economic impact assessment was carried out to determine the economic benefit and disbenefits of the proposed ICTS. The major findings of the economic impacts assessment are presented in Section 5.2.6.

2.4 Reporting

During the course of the Pre-Implementation Study, Metro Canada Ltd. and other members of the study team prepared an extensive series of interim and final reports, which formed an integral part of the overall environmental assessment process. Appendix 2 provides a summary of these reports.

2.5 Public Participation

As part of the planning process, a public participation program was undertaken. The purpose of this program was to reach as many people as possible in order to explain the project and its various phases; rank the factors used in evaluating an alignment, and determine public preference for the various alignment alternatives. Activities of this program included: Open Houses; presentations to social; business and community groups; interested institutions; public notices in local newspapers and on radio stations; and flyers distributed to residents and businesses in the study corridor and adjacent areas; schools; libraries; and on buses.

Public response was also requested through mail-back coupons, exit forms, and face-to-face discussions at the Open Houses.

Another major component of the public participation program was the Community Advisory Committee on Rapid Transit (C.A.C.R.T.). The mandate of this committee was to inform Metro Canada Limited of the community concerns and desires with respect to the Rapid Transit Study.

Details about the public participation program are presented in Chapter 6.

3.0

ALTERNATIVES AND EVALUATION

3. ALTERNATIVES AND EVALUATION

3.1 General

The purpose of this chapter is to outline:

- the planning and design alternatives and construction requirements that were considered for the proposed undertaking;
- the natural and social environmental concerns associated with each alternative to the undertaking; and
- the process of decision-making whereby each alternative was evaluated and subsequently either accepted for, or rejected from further consideration.

3.2 Transit System Alternatives

The Comparison of Transportation Modes report is being prepared to be available as a Technical Report of the Rapid Transit Study. Information concerning alternative transportation modes will be added to this draft Environmental Assessment report by the Region after its staff completes their review.

3.3 Alignment Alternatives

In the process leading to the selection of the preferred rapid transit alignment, several alignments were generated for consideration during the evaluation phase. These alignments were originally selected only if they met certain criteria related to local and regional objectives for transportation, planning, urban design, and development. They were evaluated relative to each other and the process culminated with the selection of a preferred alignment which in terms of cost, performance, convenience and environmental and social impact, was considered to meet the greatest number of basic Regional and project goals.

The alignment selection process was structured to follow six distinct phases; namely:

a) Rapid Transit System Goals and Objectives;

b) Generation of Alternative Alignment Selection Criteria;

c) Generation of Feasible Alignment Alternatives;

d) Analysis and Evaluation of Segmentalized Alignment Alternatives;

e) Analysis and Evaluation of Shortlisted End-to-End Alignment Alternatives; and

f) Final Selection of the Preferred Alignment.

A summary review of each of these phases follows.

3.3.1 - RAPID TRANSIT SYSTEM GOALS AND OBJECTIVES(12)

The principal aim of the alignment criteria generation process was to produce planning and design criteria that could be used to select a series of feasible alternative alignments for the proposed ICTS. In the process of developing these criteria, information pertaining to land use, transportation and condition of the natural and social environments, was compiled, analyzed and mapped. To ensure consistency with public priorities at an early stage, a number of policy statements were reviewed, including the Official Plan of the Regional Municipality of Hamilton-Wentworth, the draft Official Plan of the City of Hamilton and the Proposed Plan for the Niagara Escarpment. This information was synthesized into the data bank, and used to generate basic goals and objectives for the proposed rapid transit system. Through discussions with appropriate Regional and City municipal officials, preliminary goals and objectives were refined to incorporate a general concept of service which was consistent with six broad goal and objective categories. These categories, discussed below, included rapid transit service, environmental impacts, future land use, costs, technological demonstration and planning process.

a) Rapid Transit Service objectives dealt with the various transportation components of the system. They recognized the need to provide a high quality of service to the largest number of people with the least negative impact upon the existing transportation network. Elements such as bus integration, travel time and links between major activity centres were considered.

b) Environmental Impacts objectives addressed the impact of the system upon the existing natural and social environments, recognizing the importance of sensitive areas and stable neighbourhoods.

c) Future Land Use objectives recognized the potential for the rapid transit system to affect the development of the city, by providing an enhanced development potential at various nodes. In this regard, generation factors which closely reflected the planned land uses in the City were emphasized.

d) Cost objectives were considered only where the cost was related to unnecessary travel distances or where limited benefits would have been derived. This would have resulted in higher construction and operating costs.

It should be noted that because the goals and objectives pertaining to technological demonstration and planning process applied universally in all cases, they were not used to generate possible alignment alternatives.

3.3.2 - GENERATION OF ALTERNATIVE ALIGNMENT SELECTION CRITERIA

Following the identification of basic goals and objectives for the proposed undertaking, the Evaluation Team, in consultation with Metro Canada Ltd., proceeded to develop alignment selection criteria, based upon the rapid transit system goals and objectives.(9, 10, 12) In the process of developing these criteria, each member of the study team was asked to furnish a general list of planning and engineering principles to consider in locating and selecting possible feasible alignments. Thus, the selection criteria were developed to conform to basic goals and objectives associated with the transportation, urban, environmental and engineering components within the Mountain Corridor.

The major criteria used in selecting the alternative alignments are discussed below.

a) SUPPORT OF REGIONAL PLANNING POLICIES

All feasible alignments generated had to support, in principle, existing and planned policies of the Regional Municipality of Hamilton-Wentworth. This required close liaison between Metro Canada Limited and the Regional municipal governments to ensure that errant alignments were not generated.

b) SUPPORT GOALS AND OBJECTIVES

Although not all the alternative alignments met with all system goals, they all conformed to basic objectives associated with rapid transit service, minimal environmental and social impact, future land use considerations and cost.

c) DEVELOPMENT

Each alignment satisfied the following development criteria:

i) Minimal Impact on Sensitive Areas

A major consideration in the generation of alignments was to minimize physical impacts on sensitive areas such as historical sites, buildings of architectural significance and stable residential areas. Other factors included minimizing impacts on natural areas, parks and views of and from the Niagara Escarpment.

Generated alignments were checked against information on historically and architecturally significant buildings prepared by the Local Architectural Conservation Advisory Committee (L.A.C.A.C.).

Pedestrian impacts were considered in proximity both along the alignment and at station locations, to ensure that the elevated guideway did not form a barrier to pedestrian movement. In the area of station locations, transit service considerations included walking distance for patrons, for both bus transfers and walk-in riders. All station sites were proposed in areas of major pedestrian generators, such as Jackson Square and major arterial intersections.

ii) Support Development Goals

The generated alignments were selected to enhance development potential which, in turn, would not only increase transit usage but serve the regional and sub-regional growth centres in compliance with regional land use plans. The generated alignments also attempted to provide service for development nodes to the east of the CBD, serve existing or planned high density areas, and allow for the future expansion of the rapid transit system in to other areas of the Region, such as the industrial north end.

Areas which were considered as attractive station location sites, due to their bus interface and redevelopment potential, included:

Central

- Gore Park
- Jackson Square
- MacNab Street
- King - Catharine
- Bus terminal
- TH&B station
- King - Wellington
- St. Joseph's Hospital and area

Mountain

- Sub-Regional Centre (Limeridge Mall area)
- Upper Wellington - Concession Street
- Upper Wellington - Mohawk Road
- Upper Wentworth - Concession Street
- Upper James - Fennell
- Upper James - Mohawk

iii) Technology Demonstration

All generated alignments demonstrated the flexibility and advantages of the Intermediate Capacity Transit System (ICTS) as developed by the Urban Transportation Development Corporation (UTDC). In particular, generated alignments were to illustrate the opportunities that ICTS could offer in terms of fitting into an established urban setting with a minimal amount of impact on existing structures and roads.

d) TRANSPORTATION

The major factors considered in the transportation component for alignment generation were service, surface transit integration, and transportation impacts. Although travel time was considered a major factor, this element was not considered in detail until the initial evaluation of the generated alignments occurred. For the purpose of alignment generation, routes which involved significant "out of the way" travel were not considered.

The Official Plan of the Regional Municipality of Hamilton-Wentworth recognizes Hamilton's downtown as the Regional Centre and has adopted policies to further promote office and retail uses in the downtown. The Plan also recognizes the need for a high speed transit connection between the downtown and the area adjacent to Upper Wentworth Street and Limeridge Road which is being developed as a sub-regional centre with significant office and retail uses. In recognition of these two major centres, all alignments were originally generated to connect these two areas.

i) Service Characteristics

Major activity centres within the lower City and upper Mountain were considered in the alignment generation. These included areas of existing and planned high density residential, recreational, medical, institutional and educational uses.

ii) Surface Transit Integration

The ability of the ICTS to integrate with surface transit is dependent upon the bus feeder system developed in further stages of analysis. For the purpose of alignment generation, the following factors were taken into consideration:

- on the Mountain, all north-south and most east-west arterials have bus routes;
- Mountain transit is now designed to handle CBD oriented trips and local trips;
- seven north-south arterial routes from Upper James to Upper Kenilworth Street use the Jolly Cut to reach the CBD;
- Gore Park is the major transfer point for the mountain routes to the industrial area;
- MacNab Street is the major transfer point for east-west bus routes below the escarpment;
- Upper Wellington Street is approximately the centre for population disbursement on the Mountain. Thirty percent of the population is west of West 5th Street. Forty-five percent of the population is east of Upper Wentworth Street;
- all alignments generated can support a feeder bus system. However, the further west the alignment is, the more out of way travel time will be involved for the greater proportion of the Mountain population; and

- the ability to integrate with other transportation facilities such as the Toronto, Hamilton and Buffalo railway station, and Hamilton bus terminal is dependent upon station proximity. For the purpose of generation, the location of these facilities were considered.

e) PHYSICAL

All alignments generated attempted to fit within the existing road allowance right-of-way. Further analysis determined areas where minor road allowance widenings, street widenings, or lane closures might have to occur to accommodate the system. The base of the guideway was considered to be a minimum of 5 m (16 feet) on the Mountain and 5.5 m (18 feet) in the Downtown from the road surface to accommodate movement of traffic underneath it.

Other physical criteria considered in the alignment generation were:

i) maximum allowance grade of approximately 8%;

ii) allowable curvature of approximately 35 metres (higher curvature can be negotiated if necessary);

iii) station lengths not to exceed 55 m (180 feet);

iv) minimize alignment lengths to attain the service objective and minimize construction costs;

v) the transition distance at the tunnel portal from grade to fully elevated section was approximately 91 m (300 feet).

f) ENGINEERING

Important engineering criteria associated with the question of feasible alignments consisted of:

i) minimize costs;

ii) ensure that a structural fit was possible;

iii) identify major constraints to the construction of the guideway (e.g. major utilities);

iv) ensure soil and geological conditions were capable of supporting guideway structures;

v) consider utilizing existing rights-of-way (e.g. TH&B and CNR rights-of-way and future east-west mountain expressway right-of-way).

g) ENVIRONMENTAL

All alignments generated would attempt to minimize adverse impacts on the natural environment. Particular attention was devoted to the Niagara Escarpment as it is a predominant natural environmental feature within the study corridor. All generated alignments considered the following:

i) the maintenance of public access to and along the Niagara Escarpment by means of walking trails;

ii) minimal impact on the Niagara Escarpment;

iii) minimal impact on archaeological sites;

iv) the maintenance of major recreational and conservation activities;

v) minimal soil erosion, surface and groundwater pollution;

vi) minimal removal of mature trees;

vii) minimal impact on the human environment.

Existing biophysical conditions were mapped by the Environmental Consultant and used in the generation of feasible alignments which were consistent with the established environmental criteria.

3.3.3 - GENERATION OF FEASIBLE ALIGNMENT ALTERNATIVES

In applying the selection criteria to the generation of feasible alternative alignments, the Planning Team selected candidate alignments to satisfy the basic transportation needs of the mountain corridor. The candidate alignments were to be capable of being built without extraordinary costs or construction problems, while providing an acceptable level of transportation service to the City of Hamilton.

Following their selection, the candidate alignments were screened by Metro Canada Limited and the Environmental and Engineering Teams.

a) Arterial Roads Not Satisfying Alignment Generation Criteria

Although the application of the alignment selection criteria resulted in the generation of a high-density network of alignment segments, particularly below the Escarpment, certain arterial roads were deleted from further study. In this regard, the following arterial roads in the Mountain, Escarpment and Central areas of the study corridor did not satisfy the generation criteria for the reasons outlined:(13)

i) Mountain Area

o West 5th Street

A number of transportation criteria were missing in the West 5th segment and included:

- lack of high density residential development for station locations or service;
- significant out-of-way travel for a large portion of the Mountain population;

- minimal bus service integration possibilities; and

- Mohawk College is the only activity centre, however, it can be served well by a special feeder bus system.

° Upper James Street South of Mohawk

Two important transportation and development criteria were missing in this segment and included:

- existing development is oriented toward automobile travel; and

- low transit requirements, now and in the future.

° Limeridge Road

Transportation development and engineering criteria are better satisfied by construction in the proposed East-West Mountain arterial right-of-way which provides an opportunity to construct a multi-mode transportation corridor with minimal impact on existing surface transit. Therefore, Limeridge Road was dropped in favour of the proposed East-West right-of-way.

° East-West Arterial Right-of-Way West of Upper Wellington Street

Although the East-West arterial provides an opportunity to develop a multi-use transportation corridor, the segment west of Upper Wellington Street lacked the following transportation and development criteria:

- no future high density residential uses abutting right-of-way;

- involves out-of-way travel for a large portion of feeder bus passengers;

- ties into automobile oriented Upper James Street corridor.

- Fennell Avenue

  Although Fennell Avenue provides an important East-West link across the corridor, it does not have major generators or activity centres between West 5th Street and Upper Wentworth Street and is primarily fronted with low density residential units. Therefore, Fennell Avenue was considered poor in meeting transportation and development criteria.

ii) Escarpment Area

- James Mountain Road

  Part of the Region's transportation objective is to provide a greater capacity for traffic (automobile and transit) across the escarpment. James Mountain Road was considered poor from a transportation, engineering and environment criteria standpoint since a guideway could not be constructed without taking out traffic lanes, mature trees and part of the Escarpment area. The segment also connected with West 5th Street which, as previously mentioned, did not satisfy the generation criteria.

- Across Escarpment/Tunnel to Upper Wentworth Street

  This segment was considered but ruled out because of engineering and environmental problems. The segment started from the TH&B right-of-way then cut across the escarpment towards Upper Wentworth Street and would have involved considerable clear cutting of mature trees. The Engineering Team also expressed concern over the movement of talus in this area.

  All other access roads along the escarpment within the study corridor were used as alignment candidates.

iv) Central Area

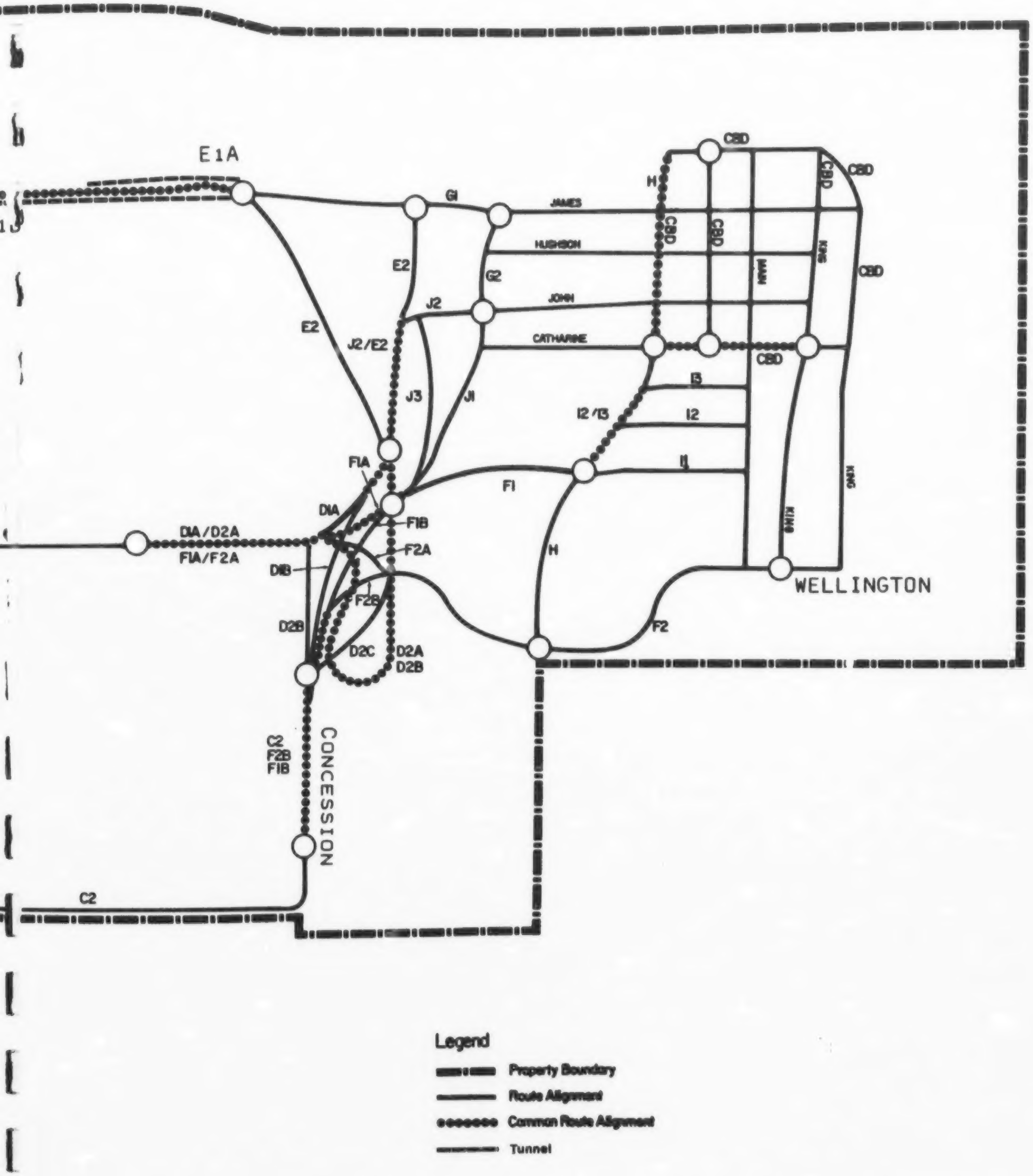
Within the downtown area, station locations were identified as providing service to principal development nodes which contain concentrations of existing and planned employment, commercial and activity centres. Alignments were selected to link these centres along appropriate downtown streets. Roads which did not provide this link were eliminated.

b) Generated Alignments

In the process of applying the alignment selection criteria, it was initially anticipated that approximately twelve (12) alternative alignments would be generated for further detailed study. Instead, a multi-path network of major alignment segments emerged, as illustrated in Figure 3.1. The alignment sub-segments were identified as possible feasible alternatives to each major segment. The generated alignments were received by the Region in January of 1981.

3.3.4 - ANALYSIS AND EVALUATION OF (ALIGNMENT SEGMENT) ALTERNATIVES

Following the alignment generation phase, the alternative alignment segments and sub-segments were analyzed individually and subsequently grouped into various combinations and evaluated relative each other. As the segments were analyzed, additional sub-segments were identified and incorporated into the analysis. The segments and sub-segments analyzed and evaluated are outlined in Tables 3.1 and 3.2 and illustrated with accompanying maps.


E1A
G1
JAMES
HUGHSON
JOHN
CATHARINE
E2
G2
J2
J2/E2
J3
J1
I2/I3
I3
I2
I1
H
CBD
MAIN
KING
F1A
F1B
F2A
F1
D1A
D1A/D2A
F1A/F2A
D1B
F2B
D2B
D2C
D2A
F2
WELLINGTON
C2
F2B
F1B
CONCESSION
Legend
Property Boundary
Route Alignment
Common Route Alignment
Tunnel

Alignment Alternatives

FIG : 3.1

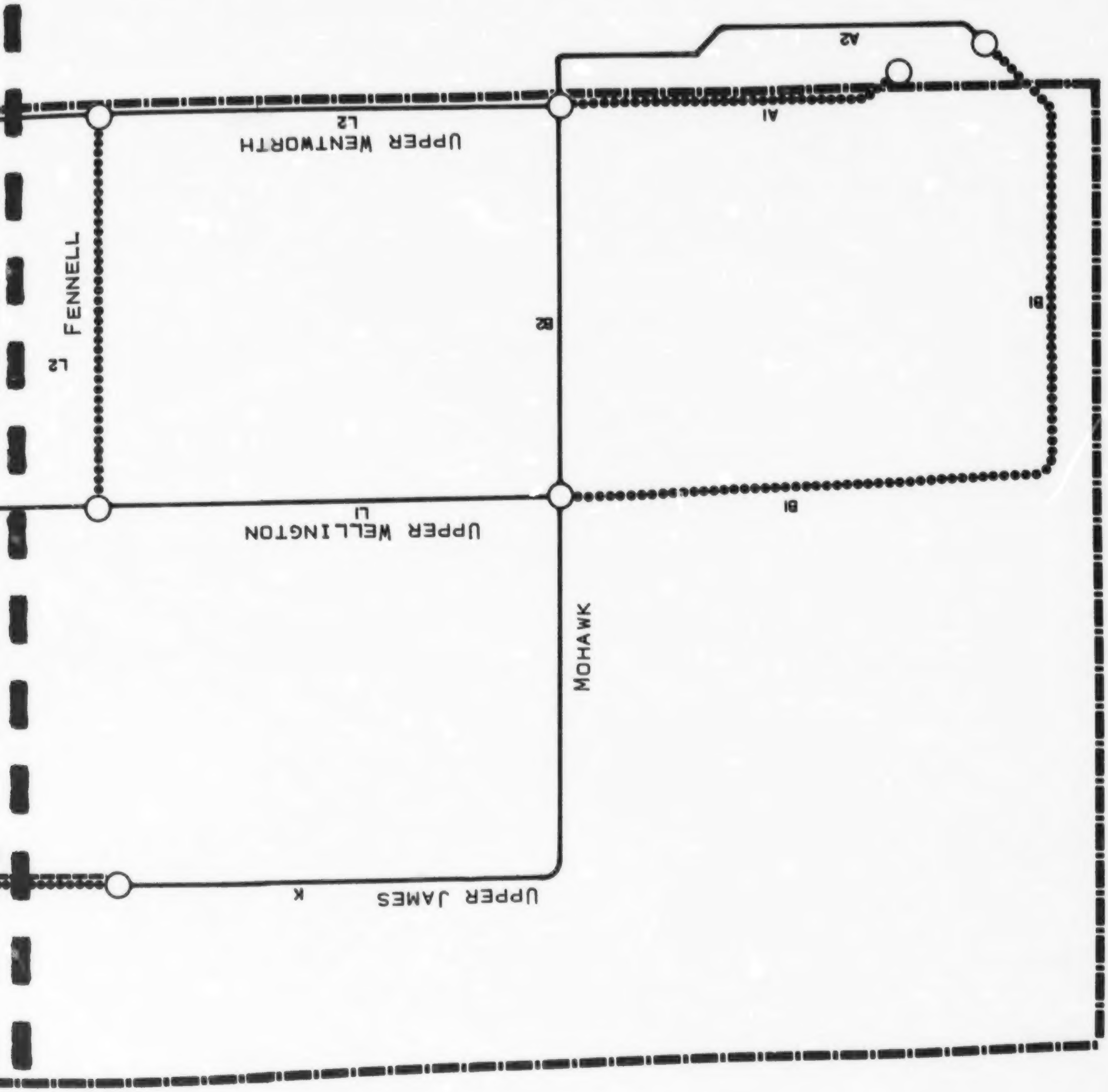

A2
A1
UPPER WENTWORTH
L2
FENNELL
L2
B2
B1
UPPER WELLINGTON
L1
B1
MOHAWK
UPPER JAMES
K

Table 3.1

Alternative Alignments
Major Segments and Sub-Segments

Segment	Sub-Segment
A	A1, A2
B	B1, B2
C	C1, C2
D	D1A, D1B, D2A, D2B, D2C
E	E1, E1A, E1B, E2
F	F1, F1A, F1B, F2, F2A, F2B
G	G1, G2
H	
I	I1, I2, I3
J	J1, J2, J3
K	
L	L1, L2
King	King, King William option
Main	
North CBD (Central Business District)	John, Hughson, James
South CBD	Catharine, John, Hughson, James
CBD Outer Loop	Outer Loop, TH&B option, King option

Table 3.2

Alignment Segment Alternatives

Segment	Location
A1	Mohawk Road and Upper Wentworth Street south to Limeridge Mall.
A2	Mohawk Road from Upper Wentworth Street east to Mall Street and south to Limeridge Mall.
B1	Mohawk Road and Upper Wellington Street south to proposed East-West arterial then east to Upper Wentworth Street and north along Upper Wentworth Street to Limeridge Mall.
B2	Mohawk Road and Upper Wellington Street east to Upper Wentworth Street to combine with Segment A.
C1	Intersection of Upper Wellington Street and Concession Street, south on Wellington Street to intersection of Mohawk Road and Wellington Street.
C2	Intersection of Upper Wellington Street and Concession Street, east on Concession Street to intersection of Concession and Upper Wentworth, south on Upper Wentworth Street to the intersection of Upper Wentworth Street and Fennell Avenue.
D1A	Intersection of Claremont Access Road and Jolly Cut via guideway to a portal then southeast, via tunnel, to a station just south of Inverness Avenue East and Upper Wellington Street.
D1B	Intersection of Claremont Access Road and Jolly Cut, via guideway to a portal, then south-east via tunnel to Concession Street and 13th Street East.
D2A	Intersection of Claremont Access Road and Jolly Cut ascending Jolly Cut to the intersection of a station just south of Inverness Avenue East and Upper Wellington Street.
D2B	Intersection of Claremont Access Road and Jolly Cut ascending the Jolly Cut to Concession Street, then east to 15th Street East.
D2C	Modification of D2A and D2B proposing a tunnel/cut and cover section just before the first ascent curve on the Jolly Cut to Concession Street and 15th Street East.
E1A	From James Street South and St. Joseph's Drive to Freeman Place (approximately), then by tunnel to Queensdale Avenue East and Upper James Street, then elevated to Fennell Avenue and Upper James Street.

Segment	Location
E1B	Similar to E1A but proposes extending the tunnel to Fennell Avenue and Upper James Street.
E2	From the intersection of James Street South and St. Joseph's Drive, along St. Joseph's Drive and Arkledun Avenue/Jolly Cut to Claremont Access Road, then along Claremont Access Road to Upper James Street and Fennell Avenue.
F1A	Commences from Ferguson Avenue/TH&B and goes south along Ferguson Avenue and enters a tunnel at contour 350' then via tunnel to approximately Queensdale Avenue and Upper Wellington.
F1B	Same as F1A except tunnel section goes eastward to emerge at Concession Street and 16th Street East.
F2A	Commences from the intersection of King/Wellington and goes south along Wellington Street onto Claremont Access Road and then veers southward of this access to enter a tunnel portal at elevation 460'. This tunnel emerges at Inverness and Upper Wellington.
F2B	Similar to F2A but the tunnel goes eastward to emerge at Concession Street and 26th Street East.
G1	From intersection of James Street South and St. Joseph's Drive, north to intersection of James Street and Charlton Street and then down either James Street, Hughson Street or John Street or via St. Joseph's Drive to John Street.
G2	From intersection of James Street South and St. Joseph's Drive to John Street and Charlton Street and then down John Street, Hughson Street or James Street, or via St. Joseph's Drive to James Street.
H	Utilizes the TH&B railway right-of-way between MacNab Street and Claremont Access Road.
I1	Intersection of King Street West and Mary Street, east to Ferguson Avenue, then south on Ferguson Avenue to Toronto, Hamilton and Buffalo Railway.
I2	From intersection of King Street West and Walnut Street, south on Walnut Street to the Toronto, Hamilton and Buffalo Railway.
I3	Intersection of King Street West and Mary Street, south to Toronto, Hamilton and Buffalo Railway, then southeast along the railway to Ferguson Avenue.
J1	Intersection of John Street North and Charlton Avenue East, east to Catharine Street, then southeast to a tunnel portal just south of the Claremont/Jolly Cut intersection.
J2	Intersection of John Street North and Charlton Avenue East, south to Arkledun Avenue, then east to Jolly Cut/Claremont Access Road intersection.

Segment	Location
J3	Intersection of John Street and St. Joseph's Drive, east along St. Joseph's Drive to portal on north side of Jolly Cut/Claremont Access Road intersection and then southeast via tunnel to the Concession Street/Upper Wellington Street intersection.
K	From intersection of Fennell Avenue and Upper James Street, south to Mohawk Road, then east on Mohawk to intersection at Mohawk and Upper Wellington.
L1	Upper Wellington from Fennell Avenue to Mohawk Road, then east to Upper Wentworth.
L2	Fennell Avenue from Upper Wellington to Upper Wentworth, then south to Mohawk Road.
CBD-North	John - John Street from the TH&B tracks to King Street. Hughson - Hughson Street from the TH&B tracks to King Street. James - James Street from the TH&B tracks to King Street.
CBD-South	Catharine - Catharine Street from Charlton Avenue to the TH&B. John - John Street from Charlton Avenue to the TH&B. Hughson - Hughson Street from Charlton Avenue to the TH&B. James - James Street from Charlton Avenue to the TH&B.
Main	From Wellington Street to MacNab Street on Main Street.
King	From Wellington Street to MacNab Street on King Street.
CBD Outer-loop	The southerly portion of the CBD outerloop starts at Catharine Street and goes west along Jackson Street to MacNab Street. The westerly portion of the CBD outerloop travels on MacNab Street to Main Street. The northerly portion of the CBD outerloop crosses the plus 15 pedestrian level of Jackson Square, swinging onto King William Street to Catharine Street. The easterly portion of the CBD outerloop travels on Catharine Street and proceeds to Jackson Street.

The evaluation procedure used throughout the study followed a cyclical procedure wherein successive alignment segments were analyzed in ever-increasing detail. The evaluation criteria used to rank and compare segments had to be constantly refined, not only to bring out basic differences between segments, but to reflect differences in land use and public input. By introducing refinements to the evaluation procedure in this fashion, it was possible to give greater attention to such detailed system components as ridership; surface transit interface; capital and operating costs; performance; overshadowing; visual integration; construction disruption and natural environmental effects. Examples of such refinements included:

- minor refinements related to street side, station sites, bus routes and profiles;
- further consideration of station types; e.g. basic design, pedestrian and vehicular connections, property requirements;
- further consideration of issues related to fire and safety access;
- further consideration of engineering and design matters related to the tunnels, particularly in the vicinity of the tunnel portals; and
- further consideration of the limits to which structures can be modified to minimize adverse effects and enhance development opportunities.

The criteria used to evaluate the alignment segment alternatives were grouped under four major headings: transportation, land use and environment, capital costs and staging. The transportation criteria were further subdivided into criteria which applied to: the ICTS service, (e.g. travel time, ridership); ancillary facilities (e.g. maintenance yard); surface transit interface (e.g. buses, trolleys); roads (e.g. road capacity, intersecting roads); pedestrian movement (e.g. along and across the right-of-way); property access (e.g. restrictions to visibility, access from one direction only and on-street parking).

A distinction was drawn in the land use and environmental criteria between alignment and station-related effects, as the type of effects associated with each tend to be different. It was also felt that if severe impacts were associated with the alignment or stations for a particular option, it would be easier to analyze the implications of modifying the station or alignment design or location.

Within the land use and environmental set of criteria, further distinctions were drawn in terms of: the displacement of uses (e.g. public open space, institutional, residential, businesses); proximity to uses; development-redevelopment; natural environmental effects (e.g. trees displaced, drainage impacts); and construction-related effects e.g. road system, land use, environmental.

The capital cost criteria were intended to include; preliminary property acquisition costs, utility relocations, infrastructure costs, and a range of other directly and indirectly related costs.

Where appropriate, consideration was also given to flexibility for staging of construction and flexibility for future expansion.

An integral part of the evaluation criteria and sub-criteria employed during this process was a list of indices used to measure relative differences amongst alignment segments.(14) Recognizing the need for some flexibility in applying the indices in a site-specific context, the indices were kept fairly general. In this way, the sub-consultant teams were left with sufficient discretion to adjust the indices and respond to the detailed issues and concerns which arose during the course of analysis.(15) To ensure a consistent evaluation process, procedures and considerations in applying the indices and associated criteria were developed for use by each Team.

In evaluating the alignment segments, each segment option was evaluated using specific evaluation criteria. Each segment option was given a subjective rating of good, neutral or poor depending on how well it achieved the intent of the evaluation criteria. The rating was a relative rating of each option compared to the other option(s) of the segment. In the evaluation process, major differences in criteria were used to select a recommended segment. Criteria which were similar or had only minor differences were not used to recommend the segment.

Results of the Segmental Evaluation procedure are summarized in Figure 3.2.

As a result of the evaluation procedure, four (4) end-to-end alternative alignments, with sub-options emerged for further detailed study. These alignments indicated a potential construction staging area between Fennell Avenue and Mohawk Road. The alignments, hereinafter referred to as Routes W, X, Y and Z, are illustrated in Figure 3.3. The major route characteristics associated with each of these alternatives are summarized in Appendix 3. These alignments were approved by the Region in March of 1981.

Prior to proceeding with the end-to-end alternative alignment analysis and evaluation process, it was necessary to eliminate some of the sub-options from consideration. This related specifically to the Mohawk/Fennell Square, the Southern Access, and the Downtown Routing. Using similar criteria to those employed in the segmental analysis, but at a higher level of detail, the following options were recommended to be used for detailed analysis in the end-to-end alignments:

1) Mohawk Road - Upper Wellington Street (Routes X1, Y1, Z1)
2) Hughson Street (Route W1)
3) King Street loop using the City Hall Parking Lot

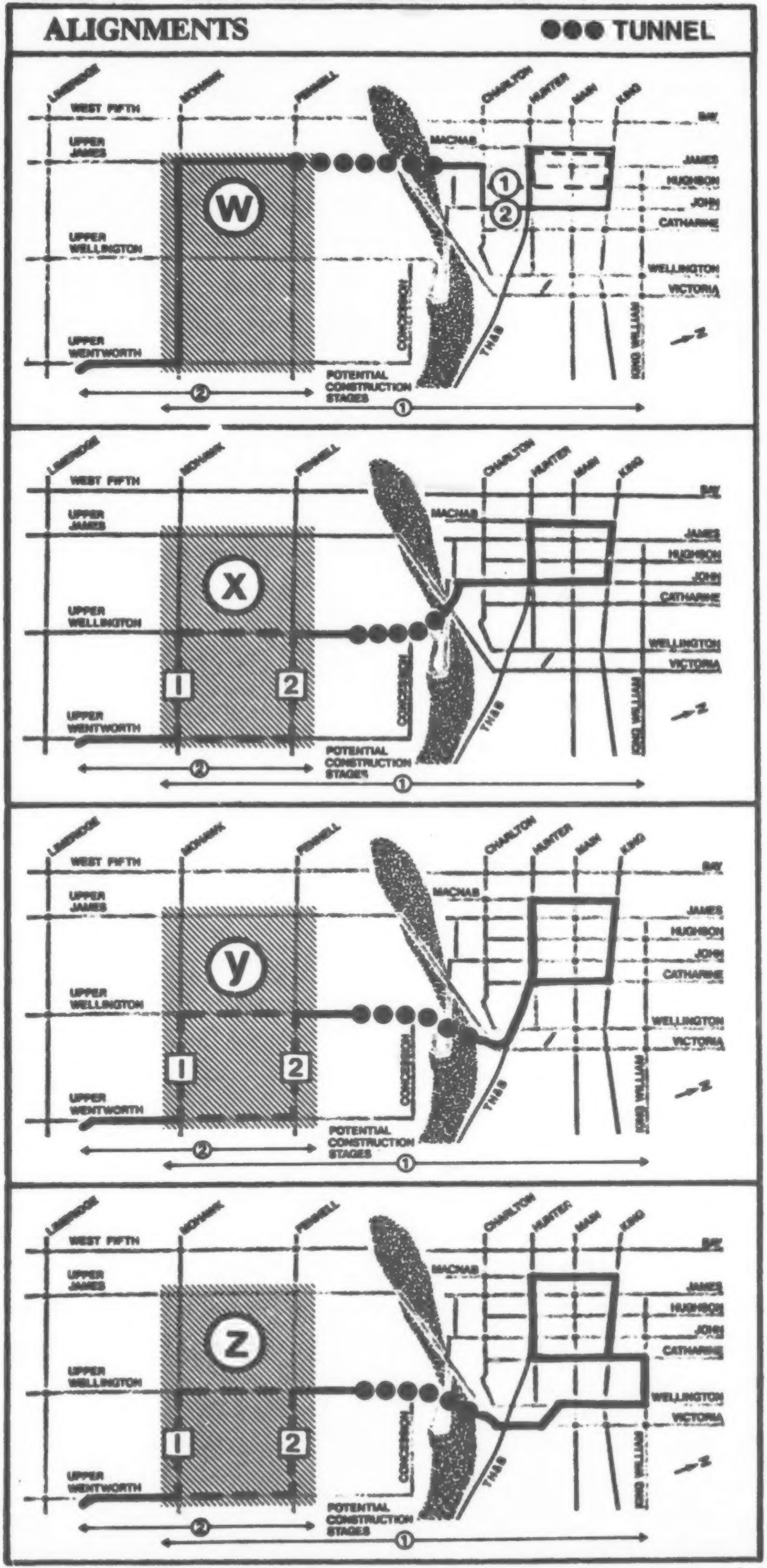
Figure 3-2: Segment Evaluation Summary

Objective Criteria	Evaluation Sequence of Alternative Alignment Segments																												NORTH(CBD)			SOUTH (CBD)				CBD	CBD
	A1	A2	B1	B2	C1	C2	D1A	D2A	D1B	D2B	D2C	E1A	E1B	E2	F1A	F2A	F1B	F2B	H	I1	I2	I3	J1	J2	J3	K	L1	L2	JOHN	HUGH-SON	JAMES	CATH-ARINE	JOHN	HUGH-SON	JAMES	KING	MAIN
TRANSPORTATION																																					
Travel Time (i.e. distance, grades, curvature)	G	P	N	G	G	G	N	P	G	P	G	N	G	P	N	N	N	N	G	N	N	N	N	N	N	G	G	G	G	G	G	P	G	N	G	G	G
Potential Maintenance Yard	N	G	G	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	G	G	G	N	G	NA	NA	NA	NA	NA	NA	NA	G	N	NA	NA	NA	P	N	G	N	N	G
Impact upon Road Capacity	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	N	G	P	G	G	G	G	G	P
Population at Stations	P	P	G	G	N	N	N	N	N	N	N	N	N	N	P	G	P	P	P	NA	NA	NA	G	G	G	N	G	N	P	P	P	G	G	G	G	G	G
Narrowing Sidewalk or Lane	G	G	G	G	N	N	G	G	G	G	G	G	G	N	G	G	G	G	G	P	N	G	G	P	G	G	G	G	N	G	P	N	N	N	N	N	P
Bus Interface Potential	G	N	G	G	G	G	N	G	N	G	P	N	N	N	N	G	N	G	G	NA	NA	NA	P	G	G	P	N	N	G	G	G	P	G	G	G	G	N
Side Street Closure	NA	NA	NA	NA	NA	NA	G	G	G	G	G	P	G	G	G	G	G	G	G	NA	NA	NA	G	G	G	G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Construction Impact on Traffic	G	G	N	N	N	N	G	N	N	N	P	N	G	P	N	P	G	N	N	P	N	G	G	P	G	G	N	N	N	G	P	G	P	G	P	N	P
Service Road Requirement	NA	NA	P	G	NA	NA	NA	NA	G	G	G	N	N	G	G	G	G	G	N	G	N	N	P	G	N	G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SOCIAL AND LAND USE																																					
Residential Units Adjacent to Alignment	G	N	N	P	N	P	G	P	G	P	G	N	G	P	N	N	N	G	G	N	P	G	N	P	G	N	P	N	NA	NA	NA	P	N	G	N		
Activity Centres Adjacent to Station Areas	G	G	G	G	N	N	P	N	N	N	N	G	G	G	N	G	N	N	N	NA	NA	NA	G	G	G	G	N	G	G	G	G	P	G	G	G	G	N
Station Potential	G	G	G	G	G	P	N	G	N	G	N	G	G	G	N	G	P	P	G	NA	NA	NA	P	N	N	G	N	G	N	G	P	P	N	G	G	G	N
Station Impacts	N	N	N	N	N	N	N	N	P	G	P	N	N	N	G	N	G	G	G	NA	NA	NA	G	N	N	G	N	G	N	G	P	N	N	N	N	G	N
Integration of Guideway with Streetscape	N	N	N	P	P	N	N	P	N	P	N	N	G	P	P	N	P	G	G	N	P	G	G	P	N	G	P	N	N	N	P	G	G	N	P	P	P
Conformity to Region/City Official Plan	G	G	G	G	G	G	G	G	G	G	G	G	G	G	P	G	N	G	G	NA	NA	NA	G	G	G	G	G	G	G	G	G	G	G	G	G	G	N
Development/Redevelopment at Stations	G	G	G	G	G	N	G	N	N	N	N	N	N	N	N	G	N	N	G	NA	NA	NA	N	N	N	N	G	N	G	G	N	P	G	G	N	G	N
Potential Approval Difficulties	NA	NA	NA	NA	NA	NA	N	P	G	N	P	N	N	P	N	N	G	G	G	NA	NA	NA	P	N	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Property Problems for Guideway	G	G	P	G	G	G	G	G	G	G	G	N	G	P	P	G	P	N	N	G	N	P	P	P	G	G	G	G	G	G	N	G	G	G	G	G	G
Property Problems for Portals	NA	NA	NA	NA	N	N	N	NA	G	NA	G	P	N	NA	P	N	N	N	NA	NA	NA	NA	G	G	G	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Property Problems for Stations	N	N	N	N	G	P	N	G	G	G	G	N	N	N	G	N	N	N	N	NA	NA	NA	G	N	N	G	P	G	G	N	G	G	N	G	N	N	N
Impact on Environmentally Sensitive Areas	G	G	G	G	G	N	G	N	N	N	P	P	P	G	P	N	P	N	G	G	G	G	P	G	N	G	G	G	NA	NA	NA	G	G	G	G	G	G
Impact on Recreation Lands	N	N	G	N	G	P	G	N	N	N	P	N	N	G	G	G	G	G	G	N	G	G	P	G	G	G	G	G	G	G	G	NA	NA	NA	NA	G	G
Views from Escarpment - Obstructed	NA	NA	NA	NA	G	P	G	N	N	P	N	G	G	N	NA	NA	G	G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	N	N	G	N	NA	NA
Views of Escarpment - Obstructed	NA	NA	NA	NA	NA	NA	G	P	G	P	N	G	G	P	G	N	N	G	N	N	N	N	G	N	N	NA	NA	NA	N	G	P	P	N	G	P	N	N
Quality of View for Passengers	N	N	N	N	P	G	P	G	N	G	G	P	P	G	P	G	P	G	P	N	N	N	G	P	G	N	N	G	N	G	G	G	N	G	G	G	P
Soil/Slope Stability	NA	NA	NA	NA	NA	NA	N	P	N	N	N	N	N	N	N	N	N	N	NA	NA	NA	NA	P	G	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Construction Impact on Businesses	G	G	G	G	N	P	G	G	G	G	G	P	N	P	G	G	G	G	G	N	N	G	G	G	G	N	G	G	N	N	P	G	P	N	P		N
Severance of Community by Portals	NA	NA	NA	NA	G	G	N	NA	G	NA	NA	P	G	NA	P	N	G	G	NA	NA	NA	NA	G	G	G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
COSTS																																					
Estimated Segment Infrastructure Unit Cost	G	N	G	N	N	N	G	P	N	P	G	N	N	P	N	N	N	N	N	P	N	G	G	P	G	N	N	N	N	N	N	N	N	N	N		
Utility Service Relocations	N	G	G	G	G	N	N	N	G	G	G	N	N	N	N	N	N	N	N	N	N	G	G	P	N	G	N	N	N	N	N	N	N	N	N	N	N
Construction Access	G	G	G	G	NA	NA	P	N	P	N	N	N	N	N	N	P	G	G	N	G	G	N	P	G	N	G	G	G	N	N	N	NA	NA	NA	NA	G	G
FLEXIBILITY																																					
Potential for Future Expansion	G	G	G	G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	N	N	G	N	N	N	G	N	N
Potential for Staging	NA	NA	NA	NA	G	P	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	G	G	N	NA	NA	NA	NA	NA	NA	NA	NA	NA
PUBLIC INPUT																																					
Community Advisory Committee/Open House	G	G	N	N			N	P	—	—	P	—	—	—	—	—	—	—	G	G	N	G	P	—	—	G	G	N			P				P	G	G
Recommended Segment	A1	—	B1	—	C1	—	D1A	—	—	D1B	—	—	E1B	—	—	F2A	—	F2B	H	—	—	I3	—	—	J3	K	—	L2	JOHN	HUGH.	—	—	JOHN	HUGH	—	KING	—

NA	Not Applicable
G	Good At Meeting Specified Objective
N	Neutral At Meeting Specified Objective
P	Poor At Meeting Specified Objective

NOTE: SEGMENT G WAS RETAINED FOR FURTHER ANALYSIS

FIGURE 3.3 SHORT LISTED ALIGNMENT ALTERNATIVES


ALIGNMENTS
●●● TUNNEL
W
X
Y
Z
LIMERIDGE
MOHAWK
FENNELL
CHARLTON
HUNTER
MAIN
KING
WEST FIFTH
BAY
UPPER JAMES
MACNAB
JAMES
HUGHSON
JOHN
CATHARINE
UPPER WELLINGTON
WELLINGTON
VICTORIA
CONCESSION
UPPER WENTWORTH
TH&B
KING WILLIAM
N
POTENTIAL CONSTRUCTION STAGES
①
②
1
2

The Regional Technical Committee accepted the first two recommendations of Metro Canada, but rejected the use of King Street as the north part of the downtown loop. They requested that Metro Canada reconsider the use of King William Street (as the north part of the loop) and other downtown route options, such as a stub end in MacNab Street. These were analyzed and evaluated. For urban design reasons, the Region was hesitant about using King Street between James Street and Catharine Street. However, there was an expressed desire to encourage the direction of development toward the King Street/Catharine Street node. Therefore, The Regional Technical Committee recommended that the end-to-end analysis of all four routes incorporate a downtown distribution system utilizing the TH&B right-of-way, Catharine Street, King William Street, James Street, King Street, MacNab Street, and the municipal parking lots around Hamilton City Hall. Stations would be located on MacNab Street, to serve the employment/commercial centre at King/James, and on King William Street at John Street, to provide service to the King/Catharine development node and the future inter-regional bus terminal.

3.3.5 - ANALYSIS AND EVALUATION OF SHORTLISTED END-TO-END ALIGNMENT ALTERNATIVES

The rapid transit study had identified two potential construction stages. The first of these extended from the downtown business district to either Fennell Avenue or Mohawk Road. The second stage extended from the southern terminal of the first stage (Fennell Avenue or Mohawk Road) to the new sub-centre in the area of Limeridge Road and Upper Wentworth Street.

At this stage of the evaluation process, a terminus at Mohawk Road was considered, shortening each of the four Routes 'W', 'X', 'Y', and 'Z' because passenger origin-destination information showed that at least 45% of all rapid transit riders are located within the catchment area of Mohawk Road station.

The evaluation that follows is based on the construction of each of Routes 'W', 'X', 'Y', and 'Z' from the downtown to a southern terminal at Mohawk Road.

In analyzing the W, X, Y and Z routes, two methods of evaluation were employed. Similar to the procedure described previously, one method involved the subjective rating of each alignment. In this case, the alignment was rated on the basis of a numbering system (e.g. 1, 2, 3 or 4), where 1 indicates best performance, and 4 indicates worst performance vis-a-vis selected evaluation criteria.

The results of this evaluation procedure are presented in Table 3.3.

Table 3.3

Evaluation Results for Routes W, X, Y and Z

Route Characteristics -	Evaluation Criteria	Ranking			
		W	X	Y	Z
Travel Time Ridership Projection	Ridership - Now	2	1	1	1
Population at Stations Major Activity Centres Redevelopment Major Office Employment Non-CBD Connections Extra Travel Time	Ridership - Potential	2	3	4	1
Bus Loops Kiss 'n Ride Maintenance Road Maintenance Yard Feeder Bus Miles Service Area Bus Miles on Escarpment Express Service Option Road Capacity Pedestrian Movements	Transportation - Interface	2	3	2	1
Side Street Access Restrictions Number of Homes Impacted	Property Access - Sidestreets	1	2	2	2
Left Turns Restricted at Homes	Property Access Along Route	1	3	3	3
Emergency Uses Impacted Left Turns Restricted at Businesses Importance of Access On-Street Parking	Property Access At Commercial	1	2	2	2
Apartment Units Single Family Homes	Displaced Uses - Housing Units	1	3	2	3
Business Units Off-Street Parking	Displaced Uses - Commercial	2	3	3	4
Buildings Open Space Potential to Replace Historical Buildings	Displaced Uses - Public	2	1	1	1

Table 3.3 (continued)

Route Characteristics -	Evaluation Criteria	Ranking			
		W	X	Y	Z
Overshadowing Total Houses Along Route Total House at Portal Privacy Impacts	Proximity to Uses - Residential	1	4	2	3
Open Space Sensitivity of Uses Historical/Architectural Significance	Proximity to Uses - Public	3	4	1	2
Bus Activity Adjacent to Homes Local Streets Used by Buses Parking on Local Streets	Proximity to Uses - Stations	1	3	4	3
Right-of-Way Widths Building Face to Building Face Potential for Land Use Change	Integration	1	4	3	2
Escarpment Road Corridors Cultural Buildings Public Areas Lengths of View	Obstruction of Views	3	3	2	1
Open Houses Briefs	Public Preference	1	3	2	1
Official Plan Goals Zoning Community Impact Land Availability	Development/ Redevelopment	3	4	4	1
Mature Trees Replaceable Trees Significance of Trees Replanting Capability	Natural Environment	4	3	1	2
Transportation Pedestrians	Construction - Transportation	1	3	4	3
Homes Businesses Environmental Sensitive Uses	Construction - Properties	3	4	1	2

Table 3.3 (continued)

Route Characteristics	-	Evaluation Criteria	Ranking			
			W	X	Y	Z
Capital Operating		Costs	1	1	2	3
Temporary Terminus		Future - Staging	1	2	2	2
Future Connections Costs to Mall		Future - Expansion	3	2	2	1

In the case of the second evaluation procedure used, each alternative route is discussed below in terms of the differences in its obvious advantages and disadvantages as related to the major criteria headings listed below. All routes displayed certain similar advantages, such as improved transit service between the Mountain and the downtown, the potential to spur and direct growth in the downtown, and to eliminate the need for a future road across the escarpment. To determine the preferred route, major differences were considered.

1) transportation;
2) direct social impact;
3) indirect social impact;
4) public input;
5) redevelopment; and
6) cost.

1) Transportation

Route 'W'

Advantages
- excellent Mountain to St. Joseph's Hospital service
- fair potential to attract walk-in transit users from Mountain
- good service to Mohawk College

Disadvantages
- Concession Street bus route to Downtown must remain
- some left turn restrictions on Upper James Street
- terminates furthest from Regional Sub-centre

Route 'X'

Advantages
- removes all bus service from Jolly Cut Mountain to Downtown service
- good potential to attract walk-in transit users from Mountain

Disadvantages
- kiss 'n ride problems at Wellington/Mohawk station
- widens Upper Wellington Street at portal area

Route 'Y'

Advantages
- good potential to introduce express bus route from Young Street/TH&B station to Bayfront Industrial area
- good potential to attract walk-in transit users from Mountain

Disadvantages
- must receive approval from TH&B and CNR to use alignment along tracks
- few opportunities to increase development and riderships in the lower city
- kiss 'n ride problems at Wellington/Mohawk Station
- widens Upper Wellington Street at portal area

Route 'Z'

Advantages

- excellent potential to attract new riders
- good potential to attract walk-in transit users from Mountain
- good potential to introduce express bus route to Bayfront industrial area from King/ Wellington station
- would encourage redevelopment at King/ Wellington growth node
- shortest distance to east and Bayfront industrial area

Disadvantages

- kiss 'n ride problems at Wellington/Mohawk Station
- turning movements restricted at Upper Wellington Street commercial area
- widens Upper Wellington Street at portal area

2) Direct Social Impact Criteria

Route 'W'

Advantages

- least visual and privacy impact on homes
- fewer side street and driveway left turn access restriction impacts
- fewer impacts to businesses
- no acquisition of residential property
- fewer potential acquisitions of commercial buildings

Disadvantages

- removal of parking spaces from two Upper James Street plazas
- effect on business during construction at Upper James Street plazas because of temporary loss of parking

Route 'X'

Advantages -

Disadvantages
- highest impact on residential privacy
- high visual impact on homes
- side street and driveway left turn access restriction impacts
- more impacts on business
- highest number of home acquisitions
- a number of commercial building acquisitions
- construction impacts of sensitive area around St. Joseph's Hospital and St. Elizabeth's Nursing Home
- less attractive to shopping environment along Upper Wellington Street

Route 'Y'

Advantages -

Disadvantages
- high visual and privacy impact on homes
- side street and driveway left turn access restriction impacts
- some impacts on businesses
- a number of home acquisitions
- a number of commercial building acquisitions
- less attractive to shopping environment along Upper Wellington Street

Route 'Z'

Advantages -

Disadvantages

- high visual and privacy impacts on homes
- side street and driveway left turn access restriction impacts
- some impacts on businesses
- a number of home acquisitions
- a number of commercial building acquisitions
- less attractive to shopping environment along Upper Wellington Street

3) Indirect Social Impact Criteria

Route 'W'

Advantages

- wide streets, therefore fewer impacts on streetscape
- fewer off-route residential units around stations to be impacted by bus activity

Disadvantages

- aesthetic impact to St. Charles Church and area between James Mountain Road and Charlton Avenue on James Street
- enters wooded area of escarpment
- removal of more mature trees

Route 'X'

Advantages

- lower aesthetic impact on escarpment

Disadvantages

- aesthetic impact on the Church of the Ascension on John Street
- relatively narrow streets, therefore impact on streetscapes
- greater impact by bus activity for off-route residential units

Route 'Y'

Advantages - lower aesthetic impact on escarpment

Disadvantages - relatively narrow streets, therefore impact on streetscapes
- greater impact by bus activity for off-route residential units

Route 'Z'

Advantages - lower aesthetic impact on escarpment

Disadvantages - relatively narrow streets, therefore impact on streetscapes
- greater impact by bus activity for off-route residential units

4) Public Input (Response to Advertisement Flyers and Open Houses)

Of those people who expressed a route preference (46% of the 725 respondents in June 1981):

- Route 'W' was the first choice of 37% and the second choice of 3%.
- Route 'X' was the first choice of 11% and the second choice of 24%.
- Route 'Y' was the first choice of 22% and the second choice of 35%.
- Route 'Z' was the first choice of 29% and the second choice of 30%.

Briefs received by the project and individual statements of preference expressed by the Community Advisory Committee members generally favoured Routes 'Y' and 'Z'.

5) Redevelopment

Route 'W'

Advantages - spot development at some station areas on Mountain

Disadvantages - minimal redevelopment opportunities in lower city and on Mountain

Route 'X'

Advantages - spot redevelopment at some station areas on Mountain

Disadvantages - minimal redevelopment opportunities in lower city

Route 'Y'

Advantages - spot redevelopment at some station areas on Mountain

Disadvantages - limited opportunities for redevelopment in lower city because of low attractiveness of TH&B railway corridor

Route 'Z'

Advantages - spot redevelopment at some station areas on Mountain
- major redevelopment potential in lower city

Disadvantages -

6) Costs

The estimated costs cited below for the four shortlisted alignments included: property acquisition costs; construction costs; and utility service relocation costs.

°	Route W	Route X	Route Y	Route Z
To Fennell	$102.6 M	$ 98.1 M	$101.9 M	$109.9 M
To Mohawk	$111.1 M	$113.4 M	$117.2 M	$125.2 M
To Mall	$143.3 M	$131.3 M	$135.1 M	$143.1 M

- Minor differences occur in ICTS operating costs over the four routes.

3.3.6 - EVALUATION SUMMARY (12)

In weighing the criteria and the performance of each route against the criteria, consideration was given to both the short and long term benefits and impacts presented by each route. For example, although in the short term, Route 'X' presented the best transportation option as it provided service to replace all Jolly Cut bus routes, in the long term, other routes prove to be more beneficial. For example:

- ROUTE 'W'

From a transportation viewpoint, Route 'W' offered service between the Mountain and the Downtown, as well as provided direct service to St. Joseph's Hospital and the Lower James Street business community. On the Mountain, Route 'W' utilized a primarily commercial street with some impact upon the housing units which were now located along the street. It entered the escarpment through an existing wooded area but tree replanting will occur to mitigate the environmental impact. It was the least expensive to construct and was a favoured route based upon public response. Some indirect social impacts would occur in the lower city area; the detailed route design would have to mitigate them. Much of the route through the lower city utilizes a route adjacent to areas of open space and vacant land to minimize impacts. Route 'W' was the route requiring the greatest additional distance for future expansion to the Regional sub-centre.

- ROUTE 'X'

Route 'X' would eliminate all bus routes from the Jolly Cut by providing access from the Concession Street to the Downtown corridor, as well as all Mountain bus routes. However, it did have strong social impacts associated with its route both on the Mountain (Upper Wellington Street) and in the Downtown area (St. Joseph's Drive and John Street). It was the least favoured route by the public.

- ROUTE 'Y'

By favouring the TH&B transportation corridor, Route 'Y' eliminated a large amount of lower city social impacts. However, the route was dependent upon the approval of the TH&B and CNR and, if the railways did not agree, the alignment along the railway tracks would not be possible. As well, although the station at Young Street provided a good opportunity for express bus service to the industrial area, it would not encourage significant development or ridership opportunities in the lower city. Route 'Y' also involved the substantial social impacts associated with the Upper Wellington Street area.

- ROUTE 'Z'

Route 'Z' offered the best long term transportation opportunities of the four routes. It had the greatest potential for attracting new riders onto the rapid transit system by providing good service to both the Mountain community as well as the opportunity for express bus service to the industrial area. It also provided better service for the large number of people whose origin or destination was in the lower east city area. Unfortunately, although its lower city social impacts were minor, (King William Street, CHARM), it would create substantial impacts while passing the residential and commercial uses now on Upper Wellington Street south of Inverness Avenue. Its impact upon the escarpment was minimal, as it entered an area which was not used for transportation purposes. In addition, it would increase downtown development potential by encouraging growth at the King/Wellington node. This long term benefit of further growth to the east of the downtown area is in accordance with the planning objectives of the Region. Route 'Z' costs the most, but it was also a favoured route by the public, mainly because of its greater coverage in the lower city area. Once constructed, it would also provide the best system expansion capability to the east and to the industrial area.

In summary, the foregoing discussions for each end-to-end route alternative are presented in Table 3.4.

Table 3.4

Summary of Route Evaluation

Major Criteria -	Summary Criteria	Ranking			
		W	X	Y	Z
Transportation Redevelopment	Transportation	2	4	3	1
Access Direct Social Impacts Indirect Social Impacts	Social Impacts	2	4	3	3
Public Input	Public Input	1	3	2	1
Cost	Cost	1	1	2	3

Note:

1 best performance
4 worst performance

3.3.7 - RECOMMENDATION - SELECTED ALIGNMENT

All four routes satisfy the basic transportation service requirements of the Central Mountain corridor. The two major areas where the most severe direct social impacts will occur are on Upper Wellington Street (Routes 'X', 'Y' and 'Z') and on St. Joseph's Drive/John Street (Route 'X'). To outweigh these impacts, substantial transportation, cost, and/or planning benefits must exist. Only Route 'Z' provided some potential to provide additional transportation benefits. Route 'Z' also provided the ability to satisfy the future development objective of encouraging an east-west oriented downtown through the development of the King/Wellington growth node. However, in addition to its substantial social impacts on Upper Wellington Street, Route 'Z' cost approximately $8 - $14 million more to construct than the other routes.

Although Route 'W' had some lower city and escarpment impacts associated with its construction that must be mitigated, the social impacts (on the Mountain) associated with Route 'W' were significantly lower than those associated with the other routes. On the Mountain, Route 'W' had the ability to utilize parking lots of commercial properties, with much less impact upon the residential properties along Upper James Street than the other routes have on Upper Wellington Street. Route 'W' suffered some transportation disbenefits, such as the need for a bus between the Downtown and the Concession Street corridor. However, the social impacts associated with the other three routes, particularly on the Mountain, favoured the use of Route 'W'. Therefore, it was the recommendation of Metro Canada Limited that the first choice for the preferred rapid transit route to study in greater detail is Route 'W'.

In order to determine the most desirable alternative route for the undertaking, the Regional Technical Committee reviewed the analysis and evaluation of the four alternative alignments. As a result of their evaluation process, the Regional Technical Committee concurred with the recommendation of Metro Canada Limited that Route 'W' was the preferred route.

On July 21, 1981, Regional Council approved Route 'W' as the most desirable alignment alternative to be considered for further study as a rapid transit route.

3.3.8 - STEEL ALTERNATIVE FOR GUIDEWAY CONSTRUCTION

On January 28, 1981, the Technical Advisory Committee requested Metro Canada Limited to evaluate the use of steel for ICTS guideway construction as an alternative to prestressed concrete - the material used at the Kingston test facility. In carrying out the assignment, the Consultants considered a number of criteria related to design, structural analysis, noise and vibration propagation, risk assessment and environmental aspects. The study, which was based on a limited literature search and preparation of conceptual designs, culminated in the preparation of a feasibility report.(16)

For each structural option, the study identified a number of positive and negative features, as summarized below:

Alternative 1 - Composite Steel and Concrete

Positive Features

a) The trapezoidal box girder section is considered the most acceptable visually, and the most appropriate for high quality urban integration.

b) Steel box girder sections are appropriate for spans in the range of 120 to 170 feet, with the most economical simple spans being in the 120 to 140 foot range.

c) There are several methods of fabricating curved beams.

d) The torsional stiffness of the composite trapezoidal box section is comparable to the concrete section.

e) In a proper application, high strength steel is extremely cost effective.

f) Tangent beam fabrication is very efficient and construction is simple and quick.

Negative Concerns

The following conclusions reached in earlier studies suggest further investigation and resolution, or a compromise, or act as a constraint in the application of steel.

a) Noise propagation. (Mitigative measures can reduce this concern.)

b) Maintenance and staining of surfaces below.

c) Control system interference may be a problem.

d) Appearance of weathering steel in the early stages of weathering.

e) Noise and vibration damping adds to the cost.

f) Fabricating curved girders results in waste material.

g) Reliable field welding and bonding is required in a variety of environmental conditions.

h) Field correction and adjustment of any misalignment is diffcult.

Alternative II - Prestressed Concrete

Positive Features

a) Flexibility in design.

b) Generally competitive cost vis-a-vis other available materials.

c) Probability of meeting the low noise transmission and radiation characteristics essential to acceptance of ICTS in an urban environment.

d) Probability of meeting low vibration transmission characteristics required.

e) Perception that it would be aesthetically acceptable in a downtown core development program.

f) Perception that concrete structure, precast offsite, could be installed with minimum disruption of city traffic patterns and existing business activities.

g) Perception that offsite precasting of beams, crossheads and columns in variable geometry steel forms would provide significant cost savings.

h) Flexibility in construction in that cast in situ techniques could be used for special structures or small scale applications where precast production techniques were less appropriate.

i) Perception that tools and labour skills required for prestressed concrete construction could be more readily made available to potential application sites on a world-wide basis.

Negative Features

a) Beam prefabrication facilities not readily available in Hamilton.

b) All switch sections would require cast-in-place concrete.

c) When mixing methods (precast and cast-in-place) matching of colour and surface is difficult possibly causing an unsightly structure in future because of long term weathering.

d) Long tangent sections rarely used and are more costly than steel.

The study concluded that steel was, in fact, a viable alternative for the proposed ICTS guideway. This recommendation has been based on the use of composite steel/concrete girder (trapezoidal). It was further concluded that the steel section could meet all the criteria for the concrete guideway, while being relatively less expensive and more readily available in the Hamilton area.

Notable concerns in the use of steel, include: noise transmission and staining caused by the weathering of steel. Nevertheless, these problems could be largely remedied with the use of noise damping devices and weather-proofing agents. Environmentally, both alternatives were perceived as having minor impacts on air quality and climate; all other factors were considered equal.

4.0

EXISTING CONDITIONS

4. EXISTING CONDITIONS

4.1 Biophysical Environment

This section provides a description of the natural environment within the study corridor. Within this context, the natural environment is understood to encompass the biological, physical, and chemical aspects of environment, in compliance with The Environmental Assessment Act, 1975.

4.1.1 - AESTHETIC QUALITY

The Niagara Escarpment provides a focal point and divides the study corridor into two areas, the Lower City Segment and the Mountain Segment.

Aesthetically the wooded area along the Escarpment serves two basic functions: it provides an attractive backdrop to the downtown area, and a frame for vistas and panoramas from the top of the Escarpment. The wooded slopes, which accommodate a segment of the Bruce Trail, provide nature hiking opportunities for local and regional residents. (Figure 4.1)

Aesthetic quality is discussed in greater detail in the functional plan.

4.1.2 - AIR QUALITY

The Ministry of the Environment air quality monitoring network in Hamilton is shown in Figure 4.2. Monitoring is most concentrated in the area below the Niagara Escarpment. One of the network's two major stations, 29025 - Barton/Sanford, is located halfway between downtown and the heavy industrial area.

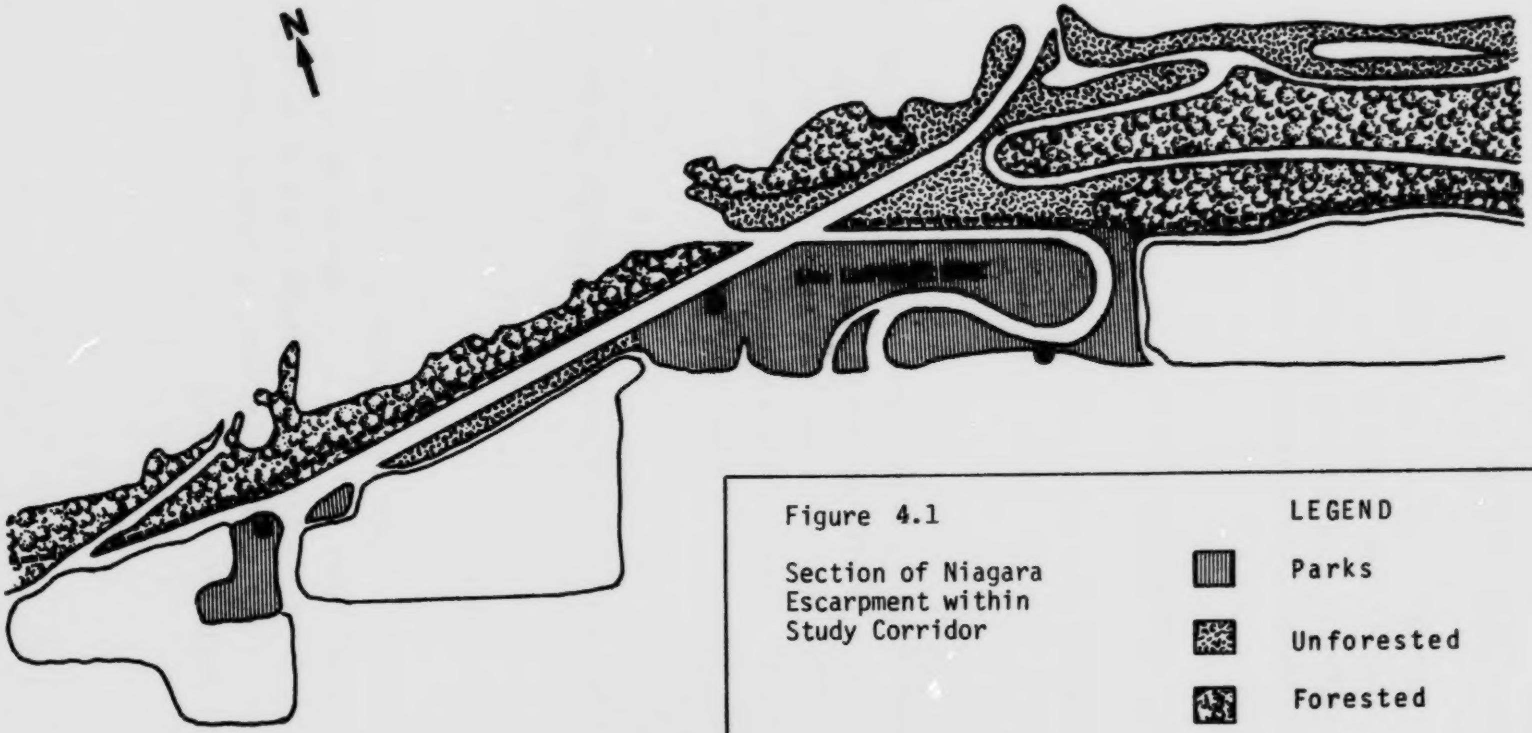

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Figure 4.1

Section of Niagara Escarpment within Study Corridor

LEGEND
▥ Parks
▨ Unforested
▩ Forested
● Lookout Point
---- Bruce Trail

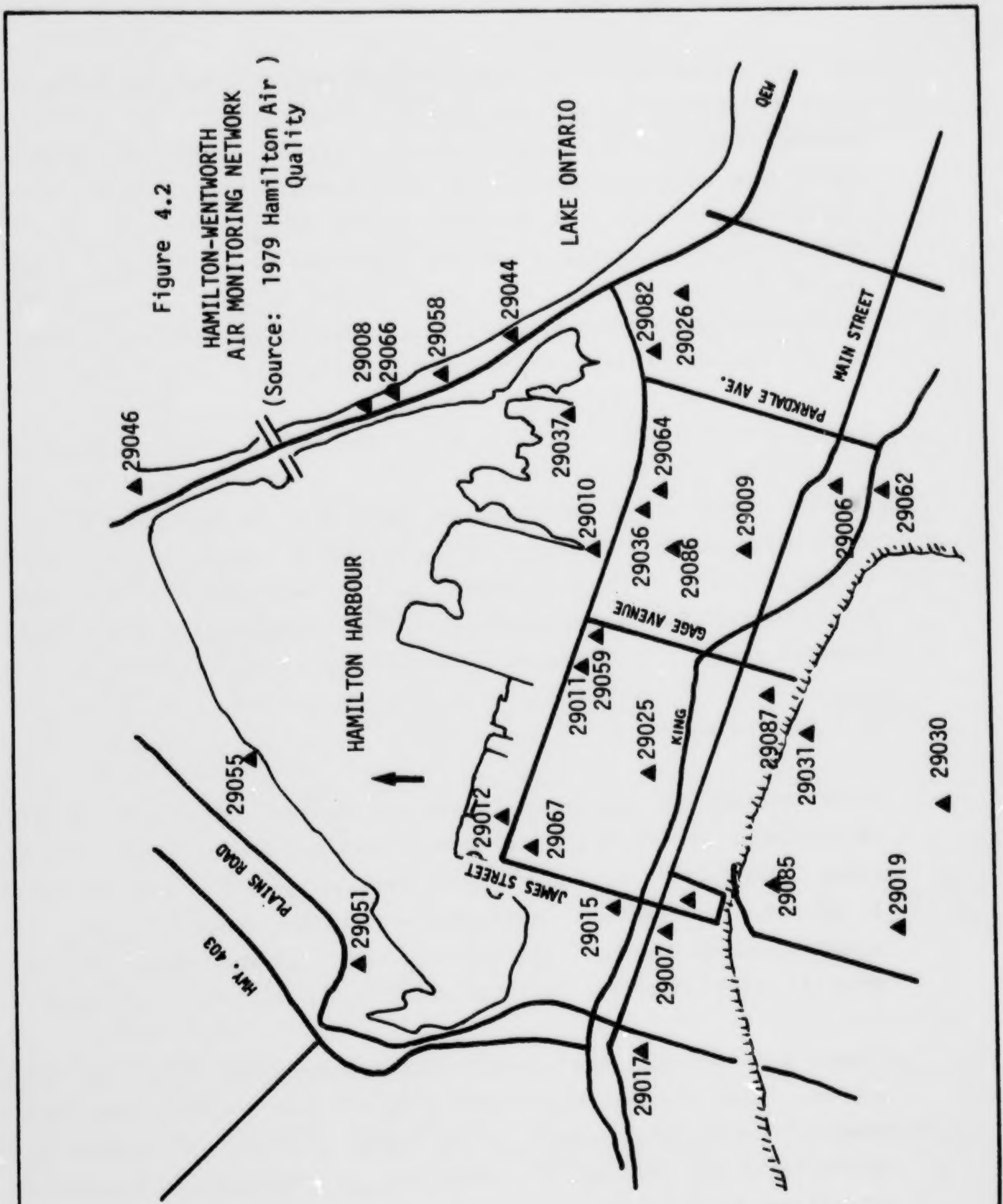


Figure 4.2

HAMILTON-WENTWORTH AIR MONITORING NETWORK

(Source: 1979 Hamilton Air Quality)

LAKE ONTARIO
HAMILTON HARBOUR
QEW
MAIN STREET
PARKDALE AVE.
GAGE AVENUE
KING
JAMES STREET
PLAINS ROAD
HWY. 403
29046
29008
29066
29058
29044
29082
29026
29037
29064
29010
29036
29086
29009
29006
29062
29011
29059
29025
29087
29031
29030
29055
29012
29067
29015
29085
29019
29051
29007
29017

a) Air Pollution Index

The Hamilton Air Pollution Index (API) is used as a warning system to alert the public to elevated air pollutant levels. The index is derived from 24-hour average concentrations of sulphur dioxide and particulate matter as measured at the Barton/Sanford station. When conditions are such that the API reaches 32 and there is also a forecast of unfavourable dispersion conditions (e.g., low wind speed and/or the presence of inversions), major emitters are asked to voluntarily curtail certain operations. When conditions are such that the API reaches 50 these cutbacks become mandatory.

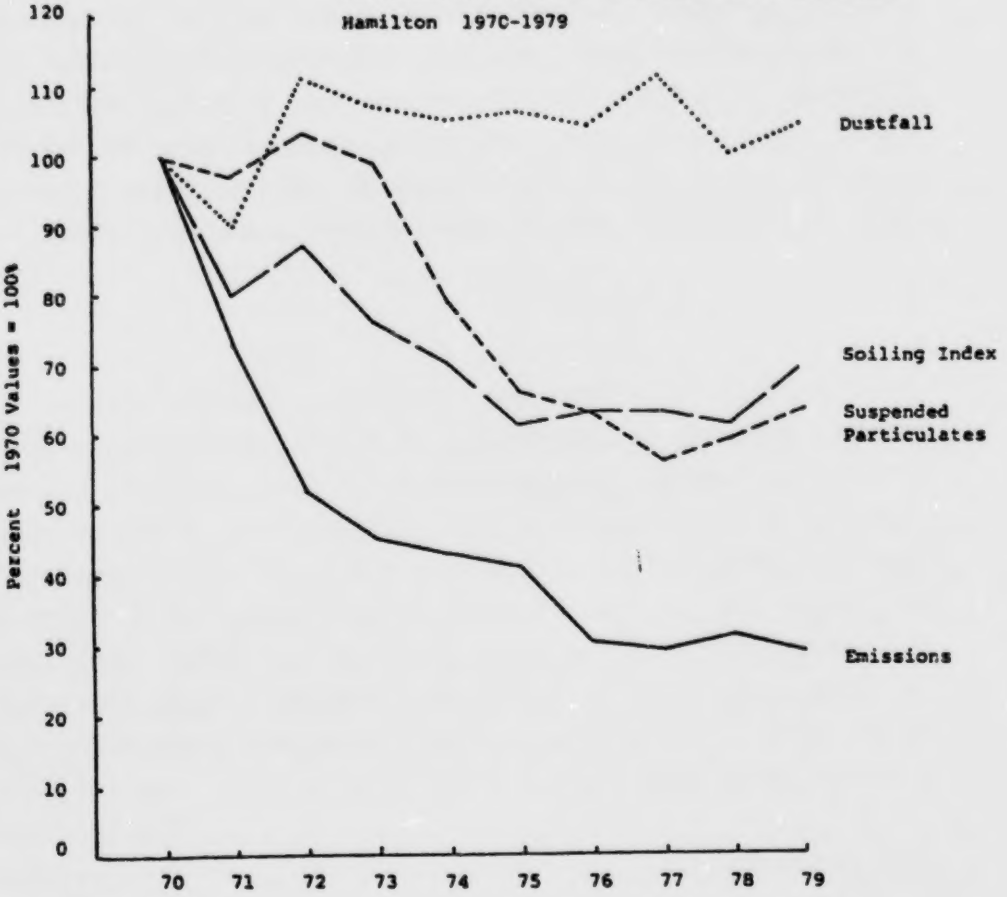
During 1979 there were 22 instances of the API reaching or exceeding 32; and for the first time since 1970, it once exceeded 50. In previous years there were usually fewer than 10 such occurrences, which were generally of less severity and shorter duration. According to the Ministry of the Environment, this reflects a greater frequency of unfavourable dispersion conditions.(17) Industrial emissions have remained essentially unchanged since 1976.

b) Particulates

Three methods of measurement used to monitor concentrations of particulates are dustfall, suspended particulates and the soiling index. Dustfall is made up of heavy material generally greater than 10 microns in diameter. Suspended particulates range in size from submicron to 50 microns. The soiling index is a measurement of fine material from submicron to approximately 10 microns in diameter.

Figure 4.3 indicates that levels of suspended particulates and the soiling index dropped significantly in the early 1970's and have remained relatively stable since 1975. This improvement is attributable to substantial reductions in emissions. Objectives established by the Ministry of the Environment are frequently exceeded in many parts of the City, especially in heavily industrialized areas. In much of the City, dustfall levels are well above the objectives established by the Ministry of the Environment. As Figure 4.3 indicates, dustfall levels have remained virtually unchanged throughout the 1970's.

FIGURE 4.3
Particulate Trends vs Estimated Total Emissions
Hamilton 1970-1979



Suspended Particulates (7 station)	131	127	135	130	104	86	83	73	77	82	$\mu g/m^3$
Dustfall (17 stations)	9.4	8.5	10.4	10.1	9.9	10.0	9.8	10.4	9.4	9.8	g/sq.m/30days
Soiling Index (7 stations)	.54	.43	.47	.41	.38	.33	.34	.34	.33	.37	COH's/1000ft.
Institutional & Industrial Emissions	56	41	29	25	24	23	17	16	17.5	16	10^6 lbs/year

(Source: 1979 Hamilton Air Quality)

c) Sulphur Dioxide

Most sulphur dioxide (SO_2) emissions stem from industrial sources, while a small portion can be attributed to the burning of fuel for domestic purposes. Sulphur dioxide concentrations in Hamilton are monitored continuously at the Barton/Sanford station. Slight decreases in sulphur dioxide levels have been observed in recent years. Yearly means have consistently remained below the objective of 52 $\mu g/m^3$ established by the Ministry of the Environment. Hourly and daily objectives have been exceeded only in isolated incidents.

d) Total Reduced Sulphur

The primary source of emissions of hydrogen sulphide (H_2S) and related sulphur compounds is industrial. Municipal and natural sources are minor contributors. Concentrations of these emissions, which are reported as total reduced sulphur, are monitored continuously at the Barton/Sanford station. Annual average hourly values have remained well below the targeted 28 $\mu g/m^3$ established by the Ministry of the Environment, although the hourly limit has occasionally been exceeded. In 1979, the hourly limit was exceeded on 75 occasions at Barton/Sanford. The high concentrations at Barton/Sanford often occurred during inversions.

e) Carbon Monoxide

The automobile is the major source of carbon monoxide (CO) emissions with minor contributions from industry. Carbon monoxide levels are monitored at the Barton/Sanford station. A marked reduction in carbon monoxide levels occurred between 1970 and 1975. Since 1975, carbon monoxide levels have remained relatively stable, well below the objectives established by the Ministry of the Environment.

f) Oxides of Nitrogen

The primary sources of oxides of nitrogen are high temperature combustion sources (e.g., industry and automobiles). Nitric oxide (NO), nitrogen dioxide (NO_2) and total nitrogen oxides are monitored continuously at the Barton/Sanford station. The Ministry of the Environment has established objectives only for nitrogen dioxide. During the period from 1975 to 1979 annual average hourly levels of nitrogen dioxide remained well below the established objectives. An unexplained peaking of nitrogen dioxide concentrations, common to other locations in the province, was observed in 1977.(17) Concentrations of nitric oxide remained stable over this period.

g) Ozone

Ozone (O_3) is a product of photochemical reactions involving nitrogen oxides, hydrocarbons, and sunlight. Ozone concentrations are directly related both to the amount and intensity of sunlight. Daily maximum concentrations occur during midafternoon, and annual maximum concentrations occur from May through September. The one hour objective of 157 mg/m^3 established by the Ministry of the Environment is occasionally exceeded. Such exceedences are widespread throughout the region and are usually considered to be a result of long range transport from the United States. Ozone concentrations in Hamilton are among the lowest recorded in Southern Ontario, probably due to the numerous high temperature combustion sources which produce higher levels of nitric oxide, a scavenger of ozone.

4.1.3 - WATER QUALITY

There are no surface water courses located within the study corridor. Almost all precipitation is diverted to storm or combined sewers. The remainder seeps into the ground or is evaporated.

4.1.4 - CLIMATIC FACTORS

Hamilton is located in the semi-continental climatic zone which is characterized by cold winters, hot summers, and precipitation throughout the year. A slight moderation of the climate occurs in the lower city because of the combined influence of Lake Ontario and the Niagara Escarpment.

The lowest mean daily temperatures occur in January and vary from -3.9°C to -5.9°C. Highest mean daily temperatures occur in July and vary from 20.6°C to 22.4°C. The mean daily temperature is between 7.7°C and 9.1°C. Temperatures drop below freezing on 132 to 152 days per year. The first frost occurs in October, the last in May, with approximately all below freezing temperatures occurring between November and March.

Average annual total precipitation varies from 79.2 cm to 84.3 cm, with the average annual rainfall providing 66.8 cm to 71.1 cm of this total and snowfall providing the remainder. Snowfall begins in October and ends in April with approximately 90% of snowfall occurring from December through March. Measurable precipitation occurs on 97 to 128 days per year.

Rainfall occurs throughout the year with two peak periods. The first peak, in April and May, accounts for 21% of annual rainfall; the second peak, from July through September, accounts for 32% of annual rainfall.

Bright sunshine occurs for an average of 2 035 hours per year, with approximately 52% occurring between May and August for an average of 8.5 hours per day.

Prevailing winds in Hamilton are westerly to southwesterly. Average wind speeds vary with location and time of year, tending to be slightly greater where the prevailing winds are westerly and during winter and early spring. The wind speeds average 13.7 to 16.7 km/h from November until May, and 10.3 to 13.7 km/h from June until November. Maximum observed wind speeds vary from 66 to 76 km/h, with peak gusts estimated at 95 to 108 km/h.

In Hamilton, temperature inversions are of importance and occur most frequently in spring and late summer. Figure 4.4 illustrates a typical advection inversion.

Inversions are discussed in greater detail in Task E-1: Existing Corridor Environment.

4.1.5 - GEOLOGY

The bedrock consists of an alternating sequence of slightly inclined Paleozoic sedimentary strata of Ordovician and Silurian age. The sequence includes: dolostones, limestones, shales and sandstones. These bedrock strata were subjected to two periods of uplift and erosion, the second of these periods probably being responsible for the formation of erosion features such as the Niagara Escarpment. The general geology within the study corridor is shown in Figure 4.5.

The bedrock sequence dips at a shallow angle to the southwest. The predominant joint sets in this rock mass are bedding joints. The beds vary in thickness from millimetres in the shale to metres in the harder dolostones and limestones. Near vertical cross-joints predominate near the Escarpment face, in all rock types, as a result of stress relief and climatic conditions. No evidence of faults in the vicinity of the proposed alignment was found in the available literature.(18)

The oldest rocks, the Queenston Formation, subcrop from the foot of the Escarpment to the lakeshore and are predominantly shales. These rocks are covered by varying depths of glacial and lacustrine soils.

The bedrock formations of the Escarpment are divided into two groups: a lower, less resistant Cataract Group and an upper more resistant Clinton Group. These formations are predominantly shales with some sandstone and limestone. A typical lithologic section through the Escarpment is shown in Figure 4.6.

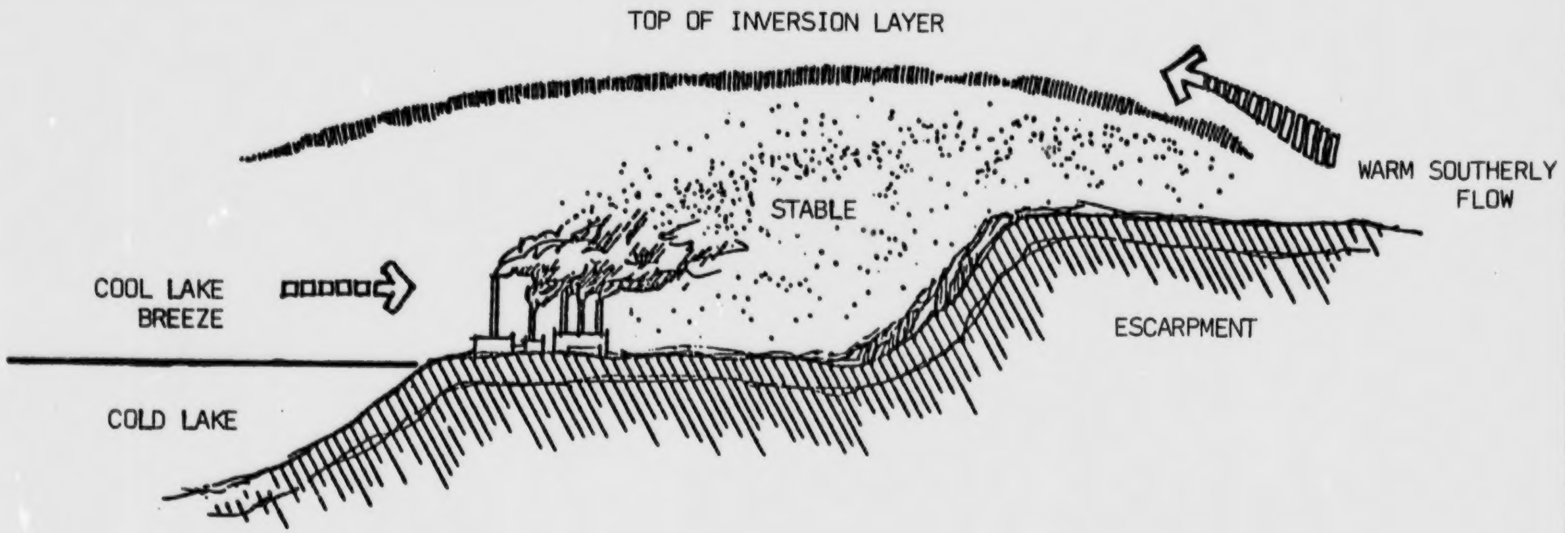
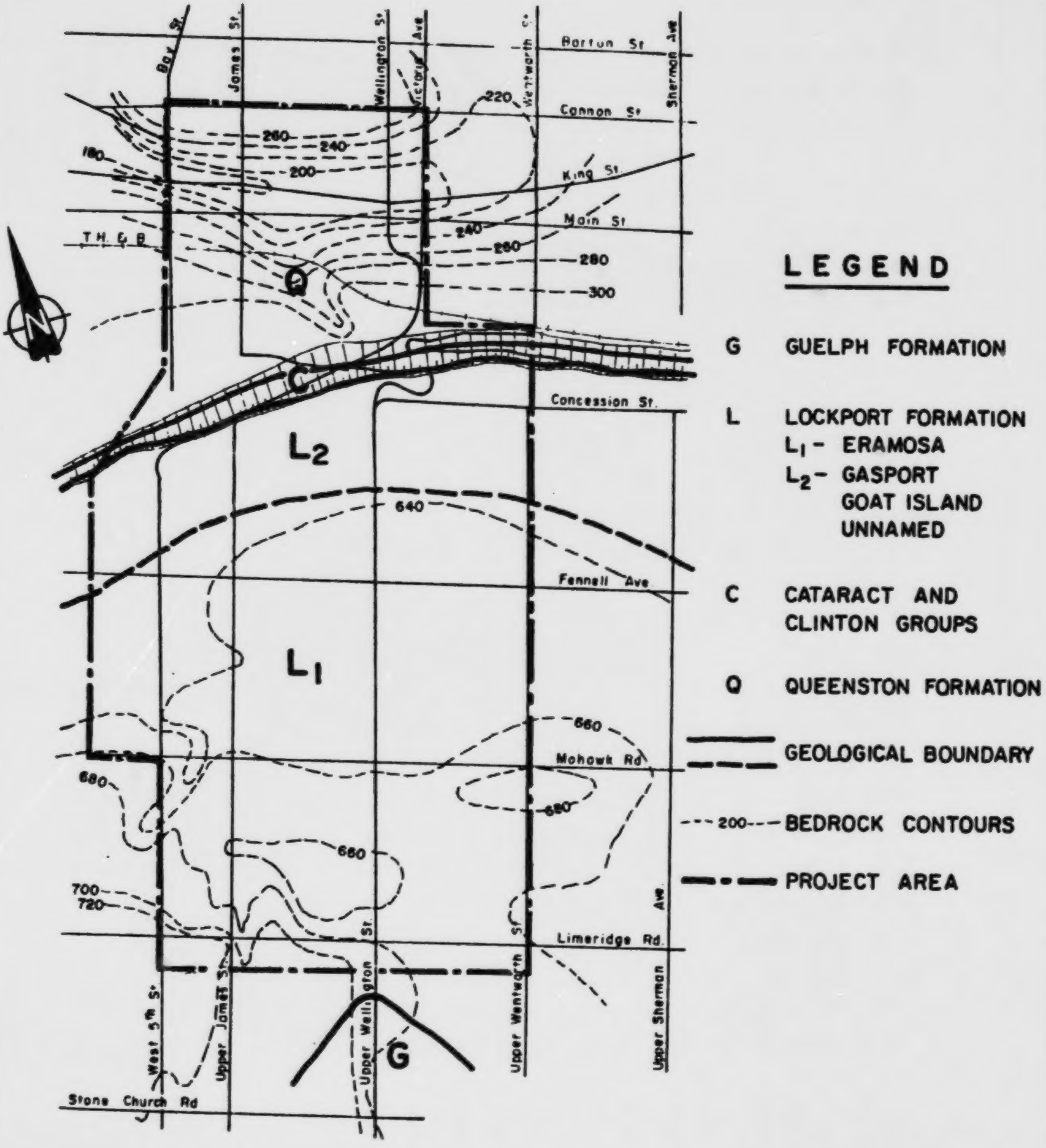

TOP OF INVERSION LAYER
WARM SOUTHERLY FLOW
STABLE
COOL LAKE BREEZE
COLD LAKE
ESCARPMENT

Figure No. 4.4

Lake Induced Advection Inversion

(Source: 1979 Hamilton Air Quality)


Barton St
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Concession St.
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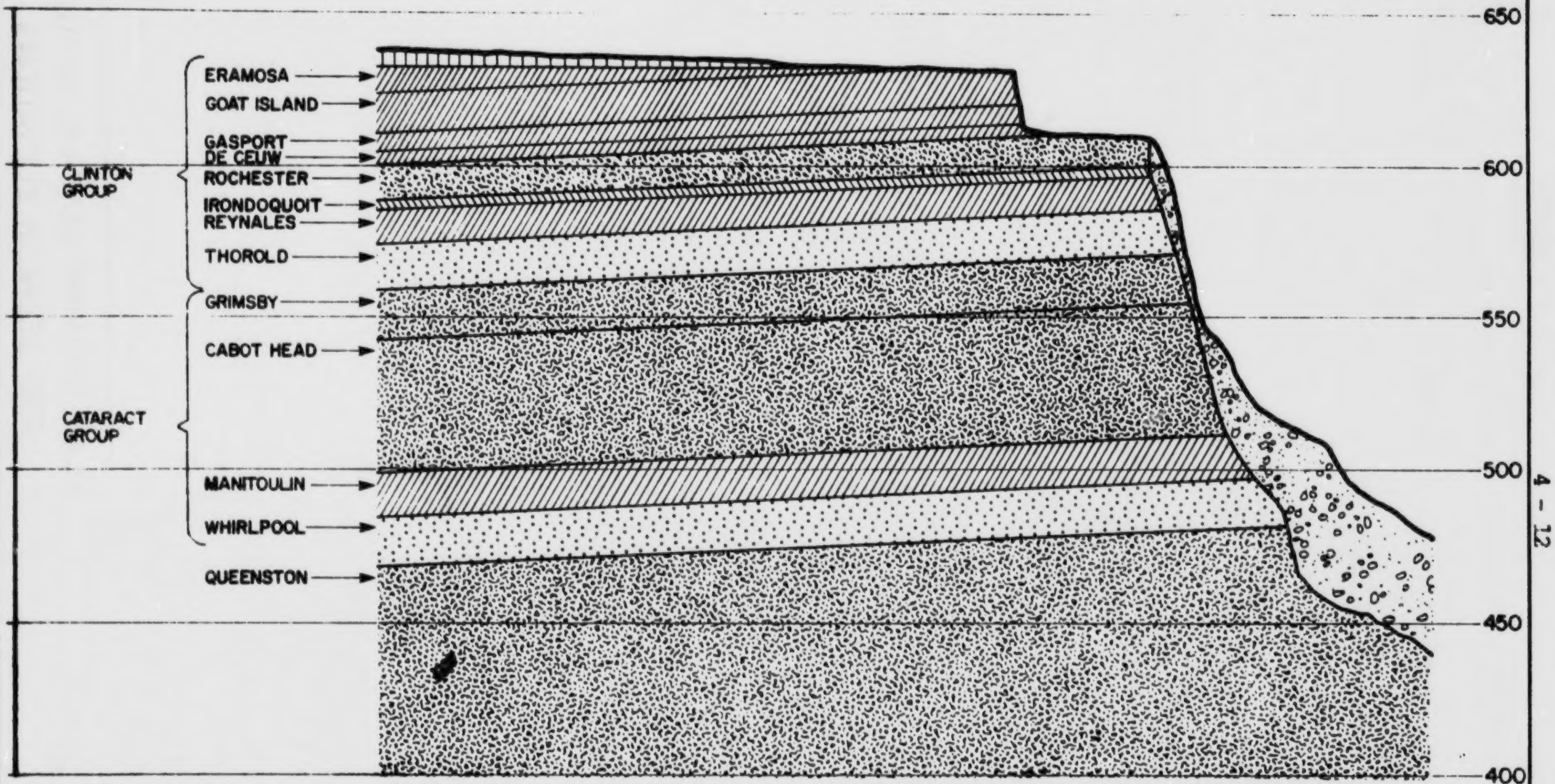
Mohawk Rd
Limeridge Rd.
Stone Church Rd
Bay St.
James St.
Wellington St.
Victoria Ave.
Wentworth St.
Sherman Ave.
West 5th St.
Upper James St.
Upper Wellington St.
Upper Wentworth St.
Upper Sherman Ave.
N
180
200
220
240
260
280
300
640
660
680
700
720
Q
C
L2
L1
G
LEGEND
G GUELPH FORMATION
L LOCKPORT FORMATION
L1 - ERAMOSA
L2 - GASPORT
GOAT ISLAND
UNNAMED
C CATARACT AND CLINTON GROUPS
Q QUEENSTON FORMATION
GEOLOGICAL BOUNDARY
200 BEDROCK CONTOURS
PROJECT AREA

NOTE

INFORMATION BASED ON MAPS FROM GOLDER, 1976 AND TROW, 1980.

PLAN SHOWING GENERAL GEOLOGY AND BEDROCK ELEVATIONS IN VICINITY OF PROJECT AREA

PROJ. E.4 | DATE: OCTOBER 1981 | FIG. No. 4.5


650
600
550
500
450
400
CLINTON GROUP
CATARACT GROUP
ERAMOSA
GOAT ISLAND
GASPORT
DE CEUW
ROCHESTER
IRONDOQUOIT
REYNALES
THOROLD
GRIMSBY
CABOT HEAD
MANITOULIN
WHIRLPOOL
QUEENSTON

(AFTER GOLDER, 1976 AND TROW, 1980)

TYPICAL LITHOLOGIC SECTION THROUGH THE NIAGARA ESCARPMENT

LEGEND

Soils

- ▥ LACUSTRINE SILTY CLAY AND CLAYEY SILT
- ░ TALUS

Bedrock

- ▒ SHALE
- ░ SANDSTONE
- ▨ DOLOMITE
- ▧ LIMESTONE

Marshall Macklin Moneghan Ltd.
Hatch Associates Ltd.

November 1980

Hamilton-Wentworth Rapid Transit Project

metro canada limited

Fig. No.: 4.6

Above the Clinton Group and underlying the surfacial deposits above the Escarpment are the dolostones and limestones of the Guelph and Lockport formations.

The shales are generally soft, erodable and tend to deteriorate (slake) with exposure to cycles of wetting and drying. The Queenston Formation has the lowest slake durability, shales of the Cataract Group are of medium durability while the Rochester Shale Formation of the Clinton Group is more durable.(19)

The dolostones and limestones in this sequence are typically strong, resistant and massive. The sandstone layers are typically quartz-rich and are consequently relatively strong and resistant.

Of particular importance to tunnelling through rock are the existence of high horizontal stresses in the rocks of Ontario. These stresses may have been caused by tectonic deformations, by erosion of overburden and/or by melting of considerable ice thicknesses that covered the region in the Pleistocene Era. Horizontal stress values recorded in the vicinity of Hamilton ranged from 1 370 to 13 800 kPa.(20) Horizontal stress measurements between 6 900 to 13 800 kPa are reported to have been undertaken in the Rochester Shale and in dolostones and limestones of the upper part of the Escarpment.

A number of upper dolomite formations are potential aquifers, although it is not indicated in the literature whether this is the situation in close proximity to the Escarpment.(21) Explosive gas has been encountered in at least one location on the Hamilton Mountain to the east of the project area. This could impact tunnelling operations.

Geology is discussed in greater detail in Task B.3: Detailing of Shortlisted Alternatives.

4.1.6 - TOPOGRAPHY

The Escarpment is the most dominant topographic feature in the area and runs in an east-west direction parallel to the shoreline of Lake Ontario. Within the study corridor, the land surface rises from King Street (approximately Elevation 92 metres) to the base of the

Escarpment (approximately Elevation 107 metres) over a distance of about 700 m. From the crest of the Escarpment at about elevation 192 metres, the land surface rises to the south to Mohawk Road at about 204 metres, over a distance of about 1.8 km.

The Escarpment is an erosional feature, formed by differential erosion of the overlying hard resistant rocks and the underlying softer, more easily eroded rocks. This process has produced a scarp face which laterally takes the form of a cuesta which faces to the northeast. The steepness of slopes within the Escarpment varies in accordance with the degree of resistance to erosion by the individual rock types.

The area is believed to have been subjected to a number of glacial surges which have modified the topography. The Halton Till and glacial lacustrine deposits located on, above or below the Escarpment were apparently deposited during the last glacial retreat of 13 000 years ago.

Further retreat of the glacier created former Lake Iroquois in the vicinity of the present Lake Ontario. Many important shoreline features were produced along the foot of the Escarpment by wave action during the existance of this lake. Lake Iroquois also deposited shallow water sands, sand bars, beach gravels and clay and silt deposits.

Before and after the glacial era, rocks of the Escarpment were subject to erosion resulting in the formation of a talus slope along its toe. This slope consequently consists of typical talus material (blocks and a matrix of clayey silt) as well as zones of glacial till.

4.1.7 - SOILS

The soils found in the study corridor can be categorized into five major soil types:

i) Fill;
ii) Lacustrine silty sand, sand and sand and gravel deposits;
iii) Silty clay to clayey silt till (Halton Till) deposits;
iv) Lacustrine silty clay or clayey silt deposits; and
v) Talus deposits.

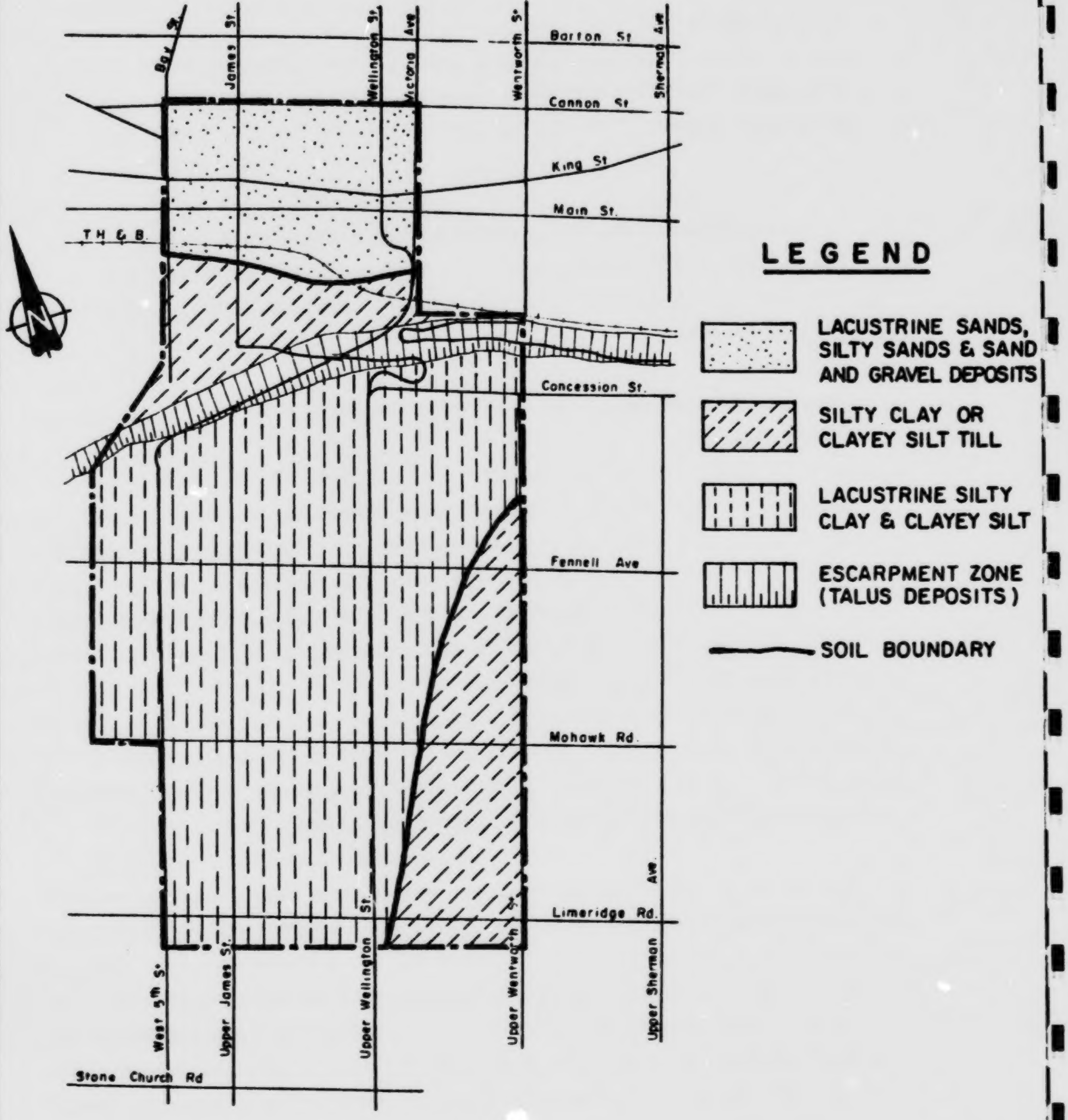
The location of these soils within the study corridor is shown in Figure 4.7.

In the Downtown Segment, the soils generally consist of varying depths of fill over lacustrine silty sands, sand and sand and gravel overlying deposits of Halton Till. The lacustrine sand and sand and gravel deposits extend to depths of 3 to 9 metres and exist in a loose state for the surficial 2 to 3 metres. The Halton Till deposits exist in a very stiff to hard condition.

Below the escarpment, the depth of overburden ranges from 3 to 7 metres in the vicinity of a buried preglacial valley generally oriented with an east-west axis near King Street.

The soils on the Mountain consist primarily of lacustrine deposits of silty clay to clayey silt in a generally stiff to hard condition.

The soils of the Escarpment zone can be categorized as either fill or talus. Significant depths of fill were placed during construction of the Claremont Hill Mountain Access Road. The talus slopes which cover the base of the Escarpment consist of angular to subangular shaped gravel, cobbles and boulders with occasional zones of sandy and clayey infilling. The soils of the flatter lower portion of the talus consist of a complicated heterogeneous mixture of glacial till and incorporated original talus material. This material exhibits the same movement characteristics inherent with most talus deposits and, therefore, has been classified as talus in the report.


Bay St.
James St.
Wellington St.
Victoria Ave
Wentworth St.
Sherman Ave
Barton St.
Cannon St.
King St.
Main St.
T H & B.
N
Concession St.
Fennell Ave
Mohawk Rd.
Limeridge Rd.
West 5th St.
Upper James St.
Upper Wellington St.
Upper Wentworth St.
Upper Sherman Ave.
Stone Church Rd
LEGEND
LACUSTRINE SANDS, SILTY SANDS & SAND AND GRAVEL DEPOSITS
SILTY CLAY OR CLAYEY SILT TILL
LACUSTRINE SILTY CLAY & CLAYEY SILT
ESCARPMENT ZONE (TALUS DEPOSITS)
SOIL BOUNDARY

NOTE

MAP FROM TROW, 1980

PLAN SHOWING DISTRIBUTION OF SURFICIAL SOILS IN PROJECT AREA

PROJ. E.4	DATE: OCTOBER 1981	FIG. No. 4.7

Some movement of talus material can be expected, especially during the spring months. This area is also the most sensitive to erosion as the soils above and below the Escarpment have been stabilized during the urbanization process.

As the majority of the proposed alignment is already urbanized and the remainder is Escarpment, the agricultural capacity of the soils is negligible.

The bearing capacity for spread footings in the native undisturbed soils below the Escarpment are marginal. Foundations on the Mountain should experience no serious difficulties.

Tunnelling or open cut sections through the talus will create problems in stabilization. The marginal stability and ongoing creep in the talus would mean that differential movements between the talus and the bedrock would have to be taken into consideration in the design of this part of a tunnel. Open cut sections through the talus would be likely to promote instability in this material.

4.1.8 - HYDROLOGY

The surface water within the study corridor originates primarily from precipitation, and seepage zones along the Escarpment face. While most of the surface water is destined to drain into Lake Ontario via local storm sewers, some of it will seep into the ground to recharge local aquifers. Small quantities will be lost to the atmosphere through evapotranspiration.

Two groundwater tables are found in the Downtown Segment. A lower groundwater table is found in the till deposits at a depth of about 11 metres. An upper perched condition has been observed in the fill and lacustrine deposits at depths generally between 3 and 6 metres.(22)

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McMASTER UNIVERSITY
HAMILTON, ONTARIO

On the Mountain, the groundwater table is generally encountered at or near the overburden-bedrock interface. In the area between Fennell Avenue and Mohawk Road, the water table is observed at a depth of 3 to 5 metres.

In the area of the Escarpment, the groundwater table is generally encountered at or near the bedrock-overburden interface although perched conditions could be encountered within localized, high permeability boulder zones.

4.1.9 - WILDLIFE

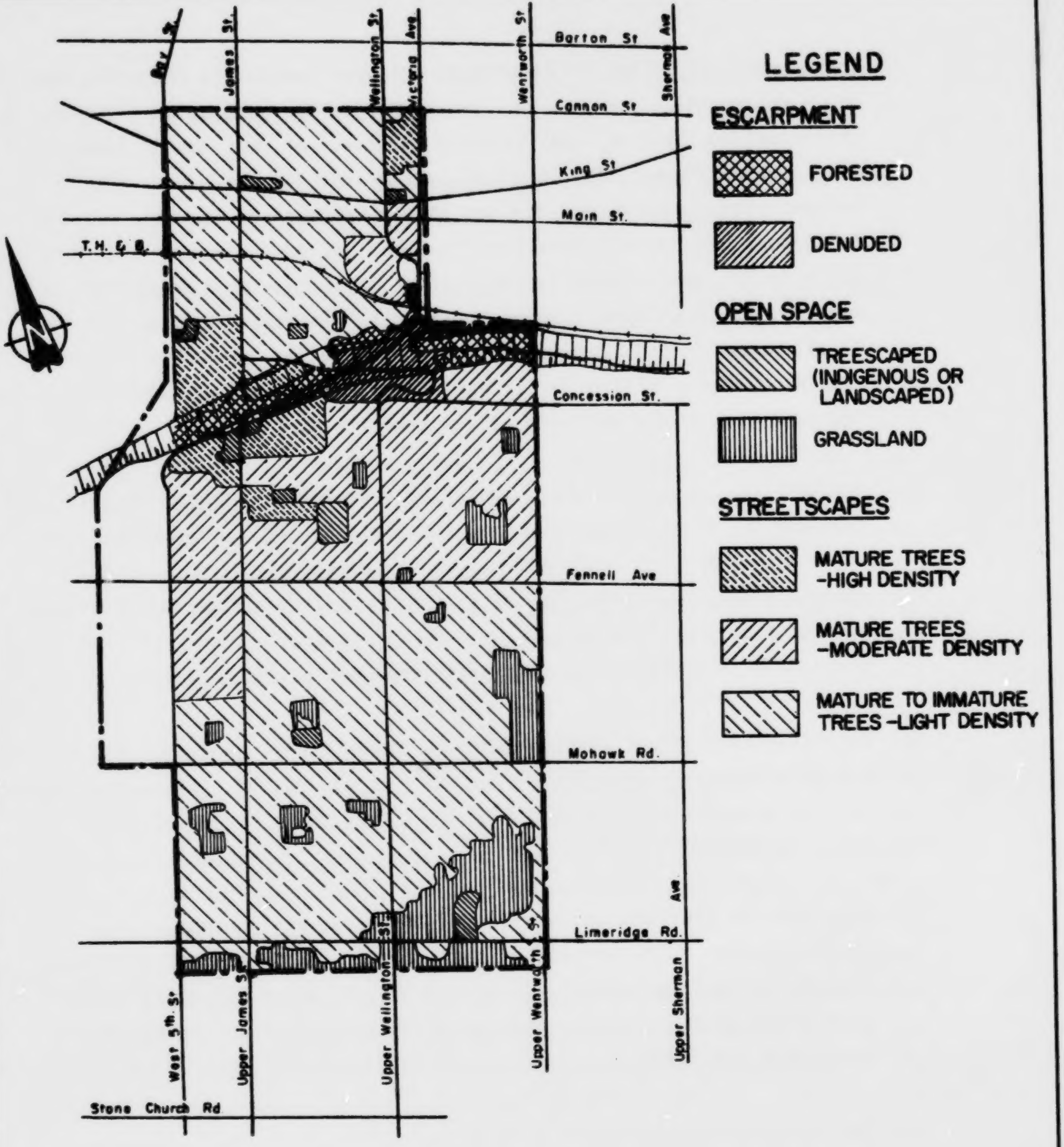
With the exception of the forested sections of the Escarpment, the study corridor is primarily an urban environment. While it is true that urbanization may severely alter the habitat and species composition representative of rural environments, it may also create a new environment, often more diverse than the old. Urban settings often contain a higher carrying capacity for wildlife than do rural environments owing to the variety of available food and shelter. Therefore, it is expected that the proposed alignment, which has well treed urban areas and heavily forested sections along the Escarpment, contains a high diversity of terrestrial and avian wildlife.

The species types, numbers and movement of wildlife in the study corridor cannot be confirmed by existing data, however, there are no wetlands or watercourses considered suitable to support waterfowl or fish habitats. There is no evidence of any rare, endangered or threatened species in the alignment.

Further discussion of wildlife is contained in the Task E-1, E-2 and E-3 documents.

4.1.10 - VEGETATION

Much of the tree cover in the study corridor has been removed as a result of the constantly expanding urbanization of Hamilton. The most extensive wooded area is found along the Escarpment, while some remnant stands (heavily thinned) occur above the Escarpment in various school yards and parks. The distribution of the forested areas are shown on Figure 4.8.


Barton St
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Concession St.
Fennell Ave
Mohawk Rd.
Limeridge Rd.
Stone Church Rd
Bay St.
James St.
Wellington St.
Victoria Ave.
Wentworth St.
Sherman Ave.
West 5th St.
Upper James St.
Upper Wellington St.
Upper Wentworth St.
Upper Sherman Ave.
N
LEGEND
ESCARPMENT
FORESTED
DENUDED
OPEN SPACE
TREESCAPED (INDIGENOUS OR LANDSCAPED)
GRASSLAND
STREETSCAPES
MATURE TREES -HIGH DENSITY
MATURE TREES -MODERATE DENSITY
MATURE TO IMMATURE TREES -LIGHT DENSITY

NOTE

INFORMATION BASED ON MAP FROM MARSHALL MACKLIN MONAGHAN, 1980

PLAN SHOWING DISTRIBUTION OF VEGETATION TYPES IN PROJECT AREA

PROJ. E.4 | DATE : OCTOBER 1981 | FIG. No. 4.8

The wooded portion of the Escarpment has been removed in the past, and now represents second or perhaps third generation growth, characterized by the semi-tolerant species of the Great Lakes - St. Lawrence Forest Region (i.e., white oak, beech, sugar maple). Remnant stands on and near the top of the Escarpment, however, contain indigenous species of Carolinean Region, including shagbark hickory which is the most common representative. The ongoing displacement of many of the Carolinean species by the more competitive species of the Great Lakes - St. Lawrence Forest Region makes protection of the remaining stands of the Carolinean Forest Region extremely important. The condition of the majority of the trees is good.

Perhaps the most important aspect of vegetation within the study corridor is that it occupies an urban setting and thus enhances the urban environment. Trees provide shade, ameliorate climatic effects, enhance visual diversity and soften the physical realities of an urban environment. In addition to increasing property values, they often instill an intangible community pride in local residents.

Further discussion of vegetation is contained in the Task E-1, E-2 and E-3 documents.

4.2 Human Environment

This section provides an overview of the human environment within the study corridor. The purpose of this section is to address the human aspects of the environment as set out in the broad definition of the word environment, given in the following section of The Environmental Assessment Act, 1975:

"Section 1(c)

(iii) the social, economic and cultural conditions that influence the life of man or a community;

(iv) any building, structure, machine or other device or thing made by man;

(v) any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly from the activities of man; or

(vi) any part or combination of the foregoing and the inter relationships between any two or more of them."

The human environment is discussed in depth in Human Environment. Some of the highlights of this report have been outlined below.

4.2.1 - HISTORY OF THE AREA

The City of Hamilton is situated in the centre of what has been traditionally called the "Golden Horseshoe", a reference to the highly populated and prosperous area that surrounds the western end of Lake Ontario from Oshawa to Niagara Falls. In 1833, Hamilton was incorporated as a Town. The community experienced rapid growth during the 1840's. In 1846, with a population of 7 000 people, it was incorporated as the City of Hamilton.

The coming of the railway in 1854 was the basis for commercial and industrial growth during the mid-nineteenth century. Hamilton's development as a manufacturing centre began in the latter half of the nineteenth century as a result of its proximity to natural resources and markets, its natural harbour, an unlimited water supply and early development of the railway routes.

The formation of the various steel companies combined with the rapid influx of immigrants from Europe and the United States during the early 1900's led to rapid increases in the City's population. In 1914, the population was just over 100 000. The City continued to attract industry by offering reduced taxes and assessments and low settlement terms.

During the 1920's, the City developed into a substantial manufacturing centre. After World War II, educational, social and cultural facilities developed as the population continued to expand. Major residential development was directed towards the land above the Escarpment. Since the early 1970's, no significant population growth has occurred in the City of Hamilton.

One of the local historical associations is the Local Architectural Conservation Advisory Committee (LACAC), a citizen's committee appointed by the City of Hamilton under the Ontario Heritage Act, 1974. LACAC has identified and prepared working lists of properties having historical or architectural value.

No archeological sites have been documented within the study corridor.

4.2.2 - EXISTING LAND USE

Existing land use around the study corridor can be divided into three areas, namely the Lower City Segment, the Mountain Segment and the Niagara Escarpment Segment.

a) Lower City Segment

The Downtown Segment is best described as a multi-use area with a land use mix of commercial, manufacturing, residential and service functions.

New development has been focused on Downtown Hamilton as part of the Civic Square Redevelopment Project which began in 1970. Some of the major institutional buildings along or near the proposed alignment are Hamilton Place, the Art Gallery, the new Library and Market Complex and the Convention Centre. The largest private commercial undertaking associated with the downtown redevelopment is the Jackson Square Complex.

The Lower City Segment also supports high density residential land use, especially in the area bounded by the TH&B railroad right-of-way to the north and the Niagara Escarpment to the south. Located within this area is St. Joseph's Hospital.

Open space and parkland is at a premium in the vicinity of the Lower City Segment.

b) Mountain Segment

Upper James Street, north of Fennell Avenue is primarily commercial development. Plaza development is evident at the intersections of Upper James Street with Fennell Avenue, and Mohawk Road. Between Fennell Avenue and Mohawk Road, development is primarily residential.

Stable residential neighbourhoods are located behind the commercial development. The housing stock is expected to remain in relatively the same condition over the next twenty years. Low density single family homes dominate the land use in most neighbourhoods. High density apartment development is concentrated along the major arterial routes that intersect Upper James Street. A three block section of low to medium density residential land use is also located along Upper James Street between Fennell Avenue and Mohawk Road.

c) Escarpment Segment

The Escarpment Segment, a section of the Niagara Escarpment, dominates the study corridor as the most significant topographic feature. The predominant land uses are open space and access routes between the Mountain and Downtown Areas. The major access routes traversing the Escarpment within the study corridor are the Claremont and Jolly Cut Accesses.

The Niagara Escarpment is designated as an environmentally sensitive area in the Regional Official Plan. Most of the scarp along the study corridor is tree covered except for the denuded or exposed rock strata associated with the mountain access roads. A section of the Bruce Trail also traverses the Escarpment and provides a panoramic link to the trail hiker.

4.2.3 - EXISTING TRANSPORTATION SYSTEMS

The only modes of transportation within the study corridor are car and bus. The major roads located along the alignment route are Upper James Street, James Street South, Hughson Street, MacNab Street, King Street, King William Street and Catharine Street. A number of arterial roads cross the study corridor. These include the Claremont Access, Mohawk Road, Fennell Avenue, Main Street, Charlton Street, John Street and Herkimer Street/St. Joseph's Drive.

The TH&B line which the alignment crosses does not carry passenger service at present.

The Downtown Area street pattern has developed into a major one-way system. Because of the volumes of traffic using the downtown streets, an interconnected signal progression system has been installed by the City to complement traffic flows along the one-way street system.

Above the Escarpment, a two-way traffic flow pattern is provided by typical suburban arterial streets. Interconnected signal progression is also used in this area, especially along the brow of the Escarpment, to regulate traffic moving downtown.

The Niagara Escarpment provides a distinct barrier to movement from the Downtown Area to the Mountain Area. To satisfy the grade climbing characteristics required by vehicles using the roads, the mountain accesses are long and circuitous along the Escarpment face.

The Mountain Corridor is the major transit demand corridor; however, because of the barrier that the Escarpment represents, a limited number of access routes are available. No new access routes are being planned and the present ones will become increasingly congested as travel demands increase.

The roads in the downtown, especially King Street and Main Street are often congested. Since the Mountain Access roads feed into the downtown, further travel demands between the Mountain and downtown will aggravate the present conditions.

4.2.3.1 - Public Transit

The Hamilton Street Railway (HSR), provides the intra-regional transit service for the Region's residents. Figure 4.9 shows the HSR Public Transit routes. The Transit route network is mainly designed to handle traffic travelling to and from the central business district. The major bus transfer location for the HSR is Gore Park. Most of the main bus routes pass through the Park. Figure 4.10 shows the bus stops in the Central Business District. Portions of some routes only operate during peak periods.

It is estimated that approximately 30 000 000 passengers ride the transit system each year. From an HSR On-Board Survey(23) it was found that:

1) Approximately 2 300 southbound passengers currently use the transit system from the lower city to the Mountain during the afternoon peak rush (excluding buses on the Kenilworth Access).

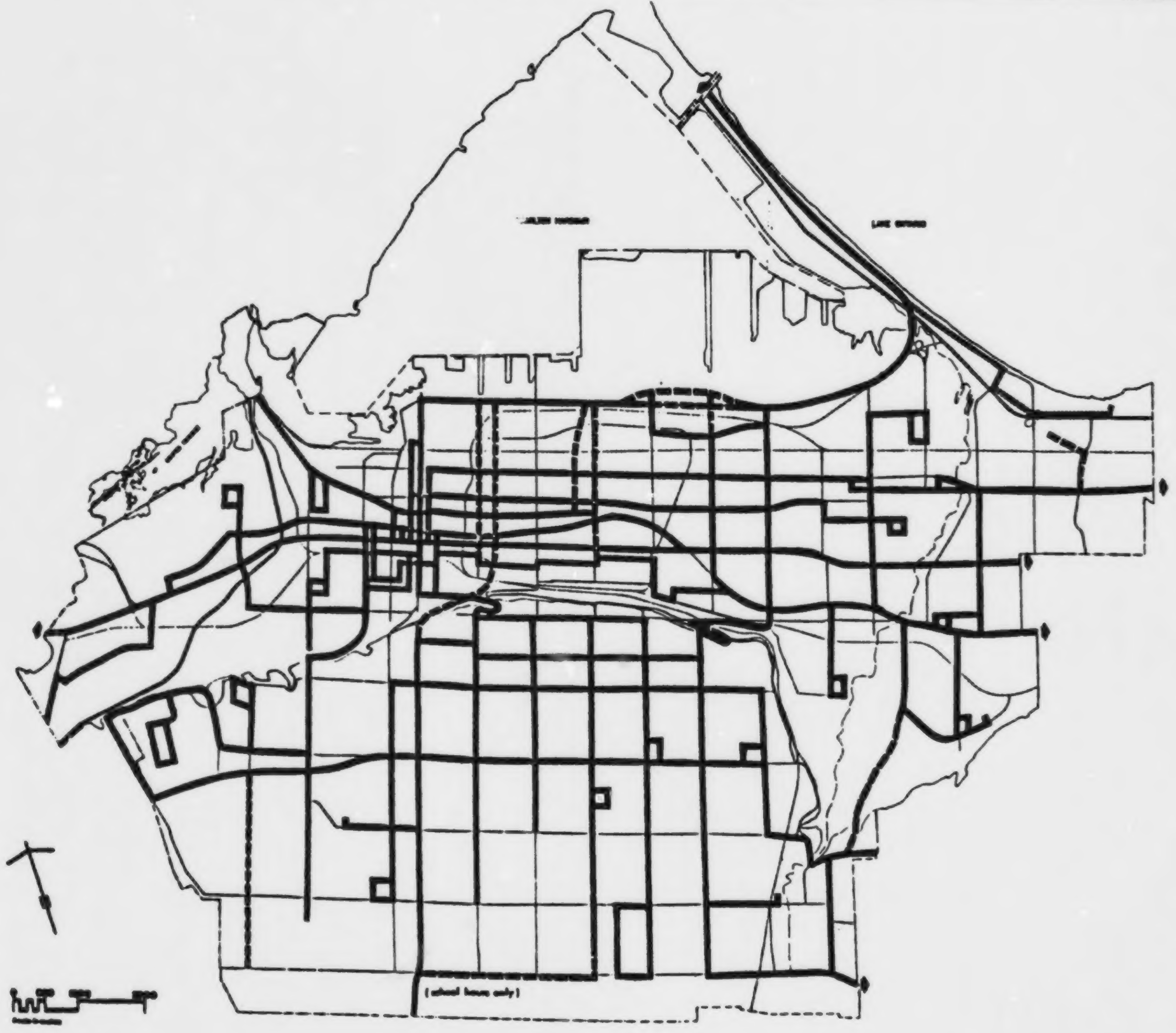
2) Approximately 33% of these riders had transferred from lower city bus routes to Mountain bus routes.

3) 93% of the passengers did not require a transfer on the Mountain to reach their destination on the Mountain.

4) Over 75% of the riders started from the central area.

A total of thirteen bus routes currently operate on the Mountain, twelve of which cross the Escarpment. A higher level of service is available to the area north of Fennell Avenue. However, service to the remaining developed areas of the Mountain is distributed so that virtually every part of the Mountain population is within .4 km of bus service.(24)

Transportation for the disabled is currently provided by the DARTS system, which is operated by the Regional Municipality of Hamilton-Wentworth.


LAKE ONTARIO
(school hours only)

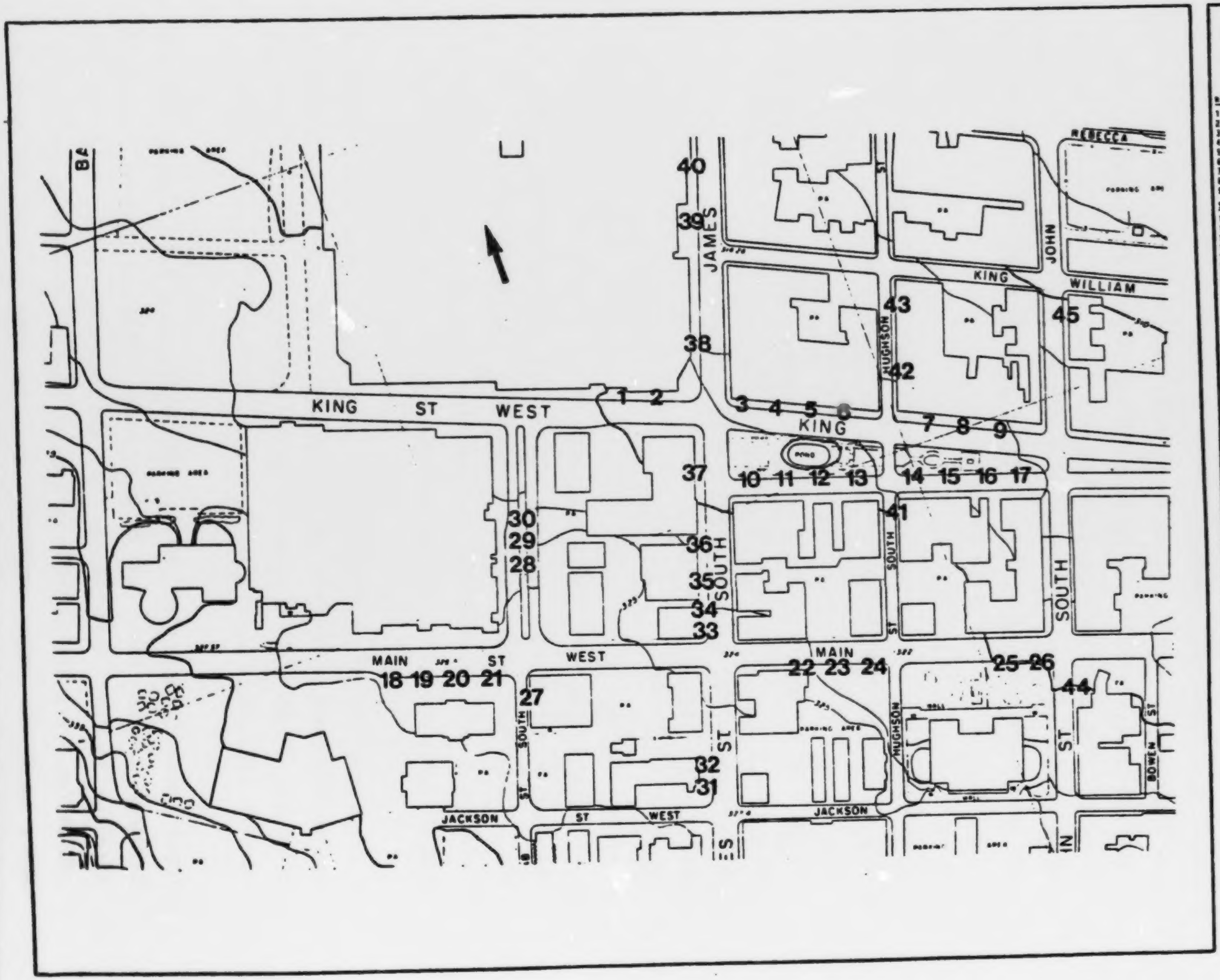
public transit

legend

h.s.r. routes (1979)

- ▬ regular service
- ▬ ▬ rush hour service
- ▮▮▮▮▮▮ summer only

Figure No. 4.9


KING ST WEST
KING
MAIN ST
MAIN
WEST
JAMES
SOUTH
HUGHSON
JOHN
WILLIAM
REBECCA
JACKSON
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Bus Stops in C.B.D.

NORTH SIDE OF KING STREET (opp. MacNab to John)

1. York
2. Dundas
3. West Hamilton & University
4. Main West
5. Garth, Sanatorium & Upper Paradise
6. King
7. C.C.L. (Interurban)
8. West Hamilton & University
9. Main-West

SOUTH SIDE OF GORE PARK (James To John)

10. Upper Wellington
11. Locke
12. Upper James & College
13. Upper Wentworth
14. Upper Sherman
15. Upper Gage
16. Upper Ottawa
17. Upper Kenilworth

MAIN STREET (from City Hall to John Street)

18. Dundas, Locke & Upper Paradise
19. Garth, Sanatorium & University
20. Delaware (Rosedale)
21. Delaware (Pottruff Rd. & Jones & King)
22. Dundas, Garth, Locke, Sanatorium, University & Upper Paradise
23. Delaware
24. King
25. Delaware
26. King

MACNAB STREET (Main to King)

27. Bayfront
28. King (S'bnd)
29. Bayfront (N'bnd)
30. Barton (S'bnd)

JAMES STREET (Jackson to Rebecca)

31. Upper Wellington
32. Upper James & College
33. Upper Wentworth
34. Upper Gage & Upper Sherman
35. Upper Kenilworth & Upper Ottawa
36. Bayfront
37. Aberdeen
38. Barton
39. Aberdeen
40. Bayfront & York

HUGHSON STREET (King to King William)

41. Barton
42. Barton
43. Cannon

JOHN STREET (King to King William)

44. Aberdeen & Dundas
45. Aberdeen, Dundas & Burlington

metro canada limited

HAMILTON-WENTWORTH
RAPID TRANSIT STUDY

FIG. No. 4.10

Inter-city transit service is provided by GO Transit and Canada Coach Lines, a subsidiary of the HSR. The present bus terminal is located at John Street and Rebecca Street. The proposed alignment passes just to the south of that site. A site for a new expanded bus terminal is suggested at the intersection of John Street and King William Street as an integral component of an ICTS station.

4.2.3.2 - Pedestrian Systems

The dominant pedestrian generator in Hamilton is the Lloyd D. Jackson Square. The two main pedestrian areas are along James Street between Main and King Streets and King Street between Catharine and James Streets. The bus transfer function of Gore Park adds significantly to the pedestrian activity in the area.

Outside the downtown area, minor pedestrian activity areas are located along James Street South.

Pedestrian systems are dealt with in greater depth in the Functional Plan.

4.2.4 - UTILITIES

Mountain Segment

Many of the major utility and municipal service routes follow or cross the major arterial routes along the proposed alignment. The relocation and continuation of services have been incorporated into the preliminary design of the undertaking.

A high pressure 400 mm diameter gas main crosses Upper James Street at South Bend Road. The gas main is generally located 1.2 to 1.5 metres from the property line with 1 to 1.2 metres of cover, and will not require relocation.

Upper James Street also carries major overhead Bell Canada Toll and Exchange cables south of Mohawk Road. These cables will not be affected by the undertaking. On the Mountain, most major feeder cables for Hydro are aerial but some on Upper James Street are buried. Where conflicts occur provision will be made to continue service.

South of Mohawk Road, all storm and sanitary sewers are separate, while north of this most of the sewers are combined. One exception to the combined sewers is the storm sewer constructed in connection with the Claremont Access.

Sewers south of Fennell Avenue on Upper James Street flow north into a large combined box sewer on Fennell Avenue. The area between Fennell and the Escarpment drains north into another large combined box sewer. This sewer flows north on Upper James Street from Inverness Avenue, then continues down the Escarpment via a drop shaft from Upper James Street to James Street South. Another large combined box sewer runs east, beginning at the intersection of Upper James Street and Mohawk Road.

Sewers are generally located under or close to the centre of the roads with approximately 3 metres of cover, below the frost line. Trunk sewers may be considerably deeper.

A 900 mm diameter trunk water main runs along Fennell Avenue through the Upper James Street intersection. The water main is usually located under the boulevard with 1.5 metres of cover and need not be relocated.

Cable T.V. cables are buried under boulevard or sidewalks with minimum cover. Relocation is not a major problem, nor is the relocation of control cables linking traffic lights to the control panels.

Escarpment Segment

The major utility and municipal service routes in the Escarpment area are: a combined sewer from Upper James Street to James Street South; and an intermediate pressure gas main and major Bell duct from Upper James Street to John Street.

Lower City Segment

There are major combined sewers on Main Street, Catharine Street and James Street. The proposed alignment would also cross sewers on Main Street. The sewers are generally located under or close to the centre of the roads with approximately 3 metres of cover, though trunk sewers may be considerably deeper.

No large water mains are located along the route of the proposed alignment. A 1 070 mm diameter water main does cross James Street between St. Joseph's Drive and Markland Street, at a depth of approximately 1.5 metres, but should not require relocation.

The proposed alignment would also cross an intermediate pressure gas main located along John Street, and a CNCP Telecommunications cable located on King Street west of James Street, and along the TH&B right-of-way between Ferguson Avenue and James Street.

Major utility and municipal services are also located along Catharine Street and MacNab Street.

The crossing of the TH&B railway line can be accomplished by meeting the Canadian Transport Commission's clearance requirements.

Most of the main feeder Hydro cables are buried in the Downtown Area. Local feeder cables on some of the major streets are buried, however, the majority are aerial on the local streets.

Cable T.V. cables are buried under boulevards or sidewalks with minimum cover. Relocation is not a major problem.

Traffic signal lights in the major downtown streets are linked by buried cables to provide co-ordinated operation. Relocation of these cables is not a major problem.

Details on Utility Relocation are available in Appendix 8 (Functional Plan).

4.2.5 - LOCAL ECONOMIC CONDITIONS

Industry has played a major role in the development of Hamilton since the late 1800's, creating a rapid growth in population. However, because of a shortage of vacant industrial land in the industrial north end of Hamilton and a lack of serviced ready-to-market industrial land elsewhere in the Region, the number of manufacturing establishments have declined.

The economy of the Region is centred on the large industrial complex present in Hamilton's north end where about 68% of the manufacturing plants in the Region are located.

The primary metals industry is the dominant group with 40% of the workers of the manufacturing sector. Other industrial groups include metal fabrication, electrical products, rubber and plastic products, machinery, foods and beverages.

The Region is promoting development of industrial parks located in the southeast Mountain Area of Hamilton and in Ancaster and Glanbrook.

The Service sector employs a large number of people, however, the growth rate of this sector has been slow, partially because of the Region's proximity to Toronto. The growth of this sector is expected to increase by 129% from 1971 to 2001. During the same period, manufacturing and construction jobs are projected to increase by 37%.(25)

Construction activity has slowed down in the residential area lately because of the lower birth rates and high interest and mortgage rates.

Tourism is expected to play a larger role in the City and the Region in the future.

4.2.6 - NOISE

The simplest and most commonly used descriptor of community noise is the equivalent sound level, L_{eq}. It is defined as the steady sound level which would contain an equivalent energy content during the measurement period as the sound actually measured, in other words, an energy average. The Ontario Ministry of the Environment employs one hour L_{eq} as the basic measurement used in their guideline and assessment procedures (Model Municipal Noise Control By-law) as does the Hamilton Noise Control By-law. They also includes restrictions on hours for construction within residential areas.

This guideline, employed by the Ministry, refers to stationary noise sources being introduced into an existing community; the existing noise sources being industry and road traffic. Since there is no perceivable industrial noise within the study corridor, the equivalent sound level resulting from the road traffic would be used as the limit against which any new noise sources would be judged.

The majority of the proposed alignment passes within commercial districts. The noise sensitive areas that could be affected by the construction and operating of the proposed transit system are:

1) St. Joseph's Hospital and area
2) High density residential areas along Hughson Street
3) Residential neigbourhoods located along Upper James Street

Two types of noise measurement were taken on the Mountain and in the Downtown Area. They were overnight measurements and one half hour short term measurements during the daytime and at night.(26) Long term measurements were taken in backyards only, since front yards invariably were exposed to an L_{eq} well above that projected for the proposed transit system.

Noise levels were recorded at a number of locations within the study corridor. The backyard values monitored on the Mountain tended to be 2-3 decibels higher than are found in most residential areas. This is probably because of their location close to major arterials and the incomplete shielding provided by the one storey houses in the area. The downtown locations were higher because of the lesser degree of shielding.

4.2.7 - REGIONAL, CITY AND NEIGHBOURHOOD CHARACTERISTICS

At the present time, the Region of Hamilton-Wentworth is undergoing slow growth. Between 1978 and 1979, the increase in population was 0.07%.(27) Population has declined in older urban areas because of smaller household sizes and increases in non-family households. The small growth experienced by the Region is a result of development of new areas on the Hamilton Mountain, Stoney Creek and Flamborough. Since 1976, Hamilton has actually been experiencing a net loss of population.

The population in the Region in 1979 was 408 200. Hamilton's population at that time was 306 500.(27) Within the Region, children (0-18 years) represent about 29% of the population. 60% of the population is in the 19 to 64 age group. The remaining 11% are over 64 years of age. The Region's population is 49% male, and 51% female.

As illustrated in Figure 4.11, the study corridor contains a number of local Neighbourhoods within its boundaries. These Neighbourhoods contain a mixture of low, medium, and in some areas, higher density dwelling types. The range of densities are determined in accordance with the needs of the population and community facilities, capacity of schools, and public services, and the adequacy of public open space to serve anticipated residents of the Neighbourhoods.

Each Neighbourhood averages 80 hectares in size and is generally defined by the grid pattern of major roads, by natural features, and/or by the Municipal boundary. Each residential Neighbourhood has as its focus, a school or park in its interior.

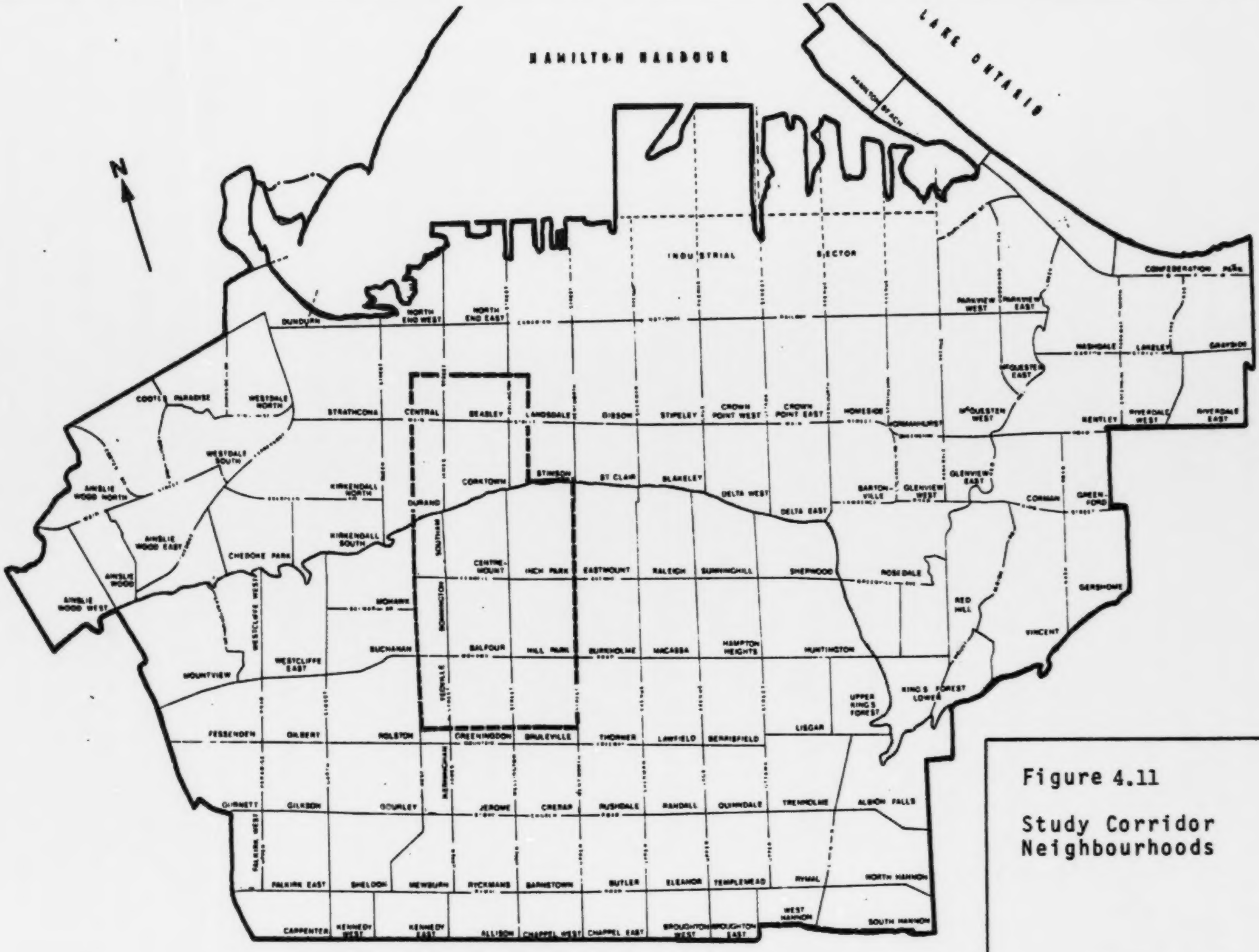

HAMILTON HARBOUR
LAKE ONTARIO
HAMILTON BEACH
N
INDUSTRIAL
SECTOR
DUNDURN
NORTH END WEST
NORTH END EAST
PARKVIEW WEST
PARKVIEW EAST
CONFEDERATION PARK
NASHDALE
LAKELEY
GRAYSIDE
McQUESTEN EAST
COOTES PARADISE
WESTDALE NORTH
STRATHCONA
CENTRAL
BEASLEY
LANSDALE
GIBSON
STIPELEY
CROWN POINT WEST
CROWN POINT EAST
HOMESIDE
NORMANHURST
McQUESTEN WEST
KENTLEY
RIVERDALE WEST
RIVERDALE EAST
WESTDALE SOUTH
AINSLIE WOOD NORTH
KIRKENDALL NORTH
CORKTOWN
STINSON
ST CLAIR
BLAKELEY
DELTA WEST
DELTA EAST
BARTON-VILLE
GLENVIEW WEST
GLENVIEW EAST
CORMAN
GREEN-FORD
DURAND
AINSLIE WOOD EAST
KIRKENDALL SOUTH
CHEDOKE PARK
SOUTHAM
CENTRE-MOUNT
INCH PARK
EASTMOUNT
RALEIGH
SUNNINGHILL
SHERWOOD
ROSEDALE
RED HILL
GERSHOME
AINSLIE WOOD
AINSLIE WOOD WEST
WESTCLIFFE WEST
MOHAWK
BONNINGTON
BUCHANAN
BALFOUR
HILL PARK
BURKHOLME
MACASSA
HAMPTON HEIGHTS
HUNTINGTON
VINCENT
MOUNTVIEW
WESTCLIFFE EAST
YEOVILLE
UPPER KINGS FOREST
KING'S FOREST LOWER
FESSENDEN
GILBERT
ROLSTON
GREENINGDON
BRULEVILLE
THORNER
LAWFIELD
BERRISFIELD
LISGAR
KENNINGHAM
GURNETT
GILKSON
GOURLEY
JEROME
CREERAR
RUSHDALE
RANDALL
QUINNDALE
TRENHOLME
ALBION FALLS
FALKIRK WEST
FALKIRK EAST
SHELDON
NEWBURN
RYCKMANS
BARNSTOWN
BUTLER
ELEANOR
TEMPLEMEAD
RYMAL
NORTH HANNON
CARPENTER
KENNEDY WEST
KENNEDY EAST
ALLISON
CHAPPEL WEST
CHAPPEL EAST
BROUGHTON WEST
BROUGHTON EAST
WEST HANNON
SOUTH HANNON

Figure 4.11

Study Corridor Neighbourhoods

The total population of the neighbourhoods bordering the proposed alignment in 1979 was 40 776. The population in the Lower City neighbourhoods is 26 734 while the Mountain neighbourhoods surrounding the proposed alignments totals 14 042.

The average population density of the Lower City area surrounding the proposed alignment is over 75 persons per net acre compared to approximately 30 persons per net acre in the corresponding Mountain area. (A further breakdown of population by neighbourhood is presented in Table 4.1, and shown on Figure 4.12.)

The Regional Official Plan projects a population increase of 142 000 by the year 2001.(28) 62% of this increase will be in the Mountain Area of Hamilton and in Ancaster and Stoney Creek. By 2001, 40% of the Region's population will be living in these three areas.

In the Lower City, some residential population will be lost through the conversion of residences to other uses or through redevelopment. However, new high density residential development in the Lower City is expected to attract additional population.

The 1971 Census, the source of the most recent Regional employment data indicates that 88% of the total 153 000 jobs in the Region were located in the City of Hamilton. It is estimated that 83% of the new jobs created will be in the City Hamilton.(28)

Table 4.1

PROPOSED ALIGNMENT
NEIGHBOURHOOD CHARACTERISTICS

Lower City

Neighbourhoods surrounding the proposed alignment:

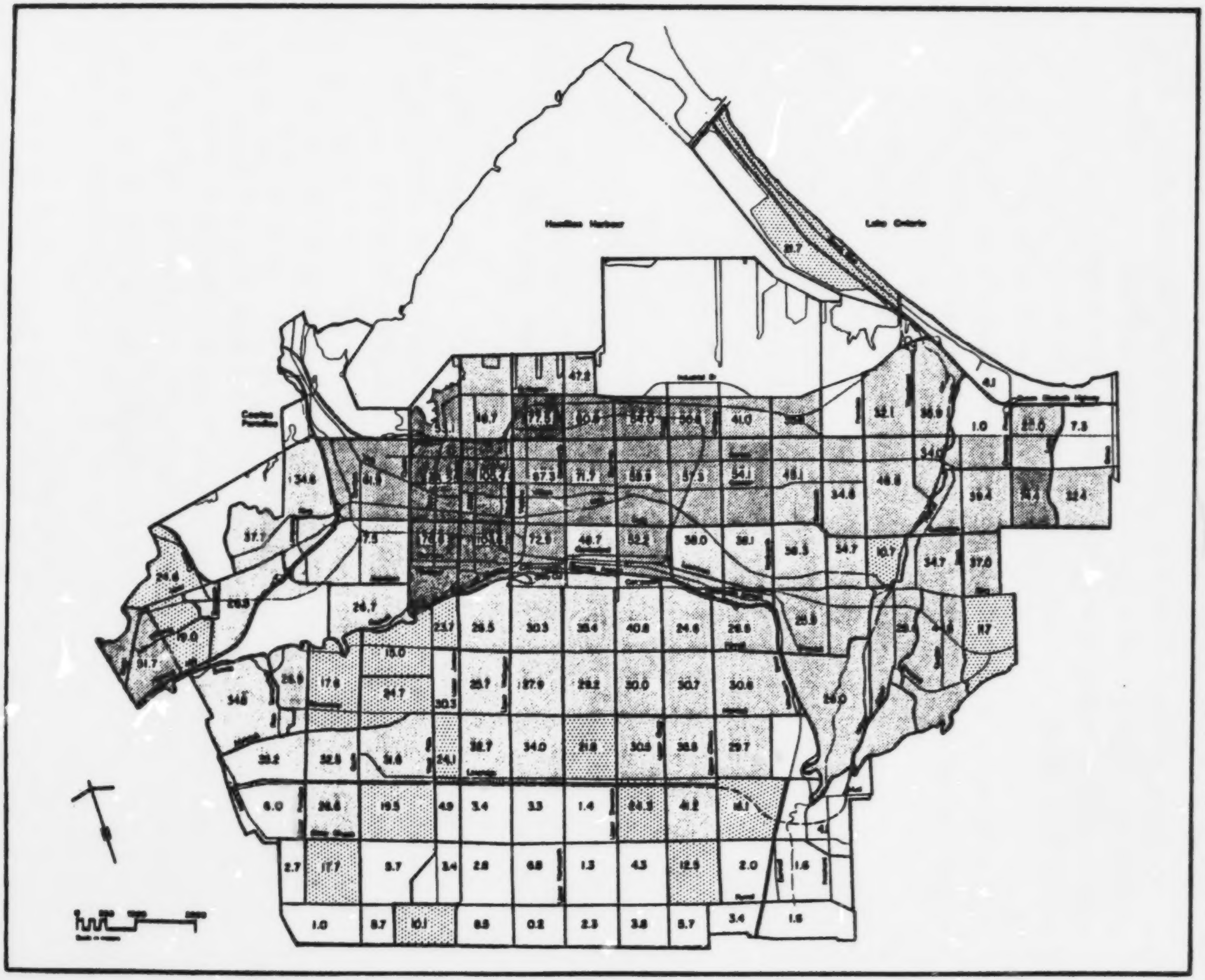
NAME	POPULATION
Corktown	6 547
Durand	10 969
Central	3 885
Beasley	5 333
TOTAL	26 734

Mountain Corridor

Neighbourhoods surrounding the proposed alignment:

NAME	POPULATION
Southam	1 037
Centremount	3 092
Bonnington	1 896
Balfour	2 812
Yeoville	1 345
Greenindon	3 860
TOTAL	14 042

Source: Regional Municipality of Hamilton-Wentworth, "1979 Population Reports", Planning and Development Department.


Hamilton Harbour
Lake Ontario
Cootes Paradise

net residential densities by neighbourhood

legend

person per net acre

■ 75+
▩ 50-75
▨ 25-50
░ 10-25
□ <10

Figure 4.12

The employment opportunities in the area around the proposed alignment are likely to be in the Services sector because of the availability of commercially zoned land. No major growth of the manufacturing sector is expected for this area.

A number of cultural and recreational facilities are located along or near the proposed alignment. These include: Hamilton Place, Art Gallery, YMCA, Canadian Football Hall of Fame, Bruce Trail, Niagara Escarpment, Mohawk College of Applied Arts and Technology and the Mountain Arena.

The following categories of community organizations are listed in a publication of the Community Information Services:

i) architectural conservancy and heritage organizations
ii) development councils
iii) environmental groups
iv) information centres
v) residents, ratepayers and neighbourhood associations and community councils
vi) miscellaneous groups

Although this publication lists groups within the Region, the majority are located in Hamilton, particularly those entitled residents, ratepayers and neighbourhood associations and community councils.

In addition to the above there are numberous ethnic and cultural groups and service clubs. Lists of these clubs are available in the following publications of the Community Information Service:

The Directory of Community Services - 1980 - 81
Service Clubs in Hamilton-Wentworth - July, 1980
Citizens Organizations, Councils and Information Services - July, 1980
Ethnic and Cultural Directory - April, 1979

4.2.8 - PLANNING CONTEXT

A) Official Plans

Both the City of Hamilton and the Regional Municipality of Hamilton-Wentworth have Official Plans for their area municipality. The Regional Official Plan was approved by the Minister of Housing on June 26, 1980. The Regional Plan contains general and specific policies giving public transit a high priority in the planning of new transportation facilities in the area to produce an integrated and balanced transportation system. Downtown Hamilton would be the primary focal point of transit service. Public transit will be included as an integral part of the planning of major new residential developments and commercial and employment centres.

The City of Hamilton's Official Plan (draft) has been recently up-dated to conform with the Region's Official Plan Policies.

B) Transportation Capital Facilities Plan

The 1981 Transportation Capital Facilities Plan identifies a rapid transit connection between Hamilton Mountain and downtown Hamilton as tne only feasible rapid transit line within the planning horizon.

"Rapid transit in Hamilton has been investigated in a number of studies and its has been concluded that a rapid transit connection between Hamilton Mountain and downtown Hamilton is the first priority. Information in the studies suggest that no other rapid transit line will be feasible within the planning horizon. The Mountain rapid transit line must be implemented in order to accommodate development in downtown Hamilton and to encourage residential development on the Hamilton Mountain. The timing of the facility is dependent on these two areas and on the availability of financial aid from other levels of government."(29)

4.2.9 - PROPOSALS FOR FUTURE DEVELOPMENT

Commercial/Service

The Regional Official Plan designates downtown Hamilton as the Regional Centre and contains policies that promote its development as the most important multi-functional office employment area and retail centre in the Region. The Official Plan has expanded the Central Business District to include commercial and institutional lands south of it.

In the downtown area only 7% of the area zoned as commercial space has actually been constructed to date, indicating that there are ample opportunities for future development.(30) The entire route of the proposed alignment north of the TH&B tracks is included within the expanded Central Business District.

Upper James Street north of Fennell Avenue is dominated by commercial development. Plaza development occurs at the intersection of Upper James Street with Mohawk Road and Fennell Avenue.

Residential Central Area

The Central Policy Area Plan in which the downtown portion of the study corridor is located, suggests construction of 31 800 units for an estimated 60 900 residents at an average density of 227 persons per net acre.(13) Approximately 64% of these units would be apartments.

Residential Mountain Area

The residential developments adjacent to Upper James Street have formed stable neighbourhoods and the housing stock is expected to remain in relatively the same condition for the next twenty years. There is no space for low density residential development in this area.

Industrial

The major industrial areas in Hamilton are located to the north of the study corridor. No major industries are located along the route of the proposed alignment.

Transportation

The Niagara Escarpment has been designated as an Environmentally Sensitive Area in the City of Hamilton's Offical Plan and the Regional Official Plan. No new Mountain access routes are planned within the study corridor. The new inter-regional bus terminal may be integrated into one of the downtown ICTS stations.

5.0

ENVIRONMENTAL IMPACTS IN THE PROPOSED ICTS

5. ENVIRONMENTAL IMPACTS OF THE PROPOSED ICTS

Any large projects, particularly of the scope and magnitude of the proposed Hamilton-Wentworth ICTS, could have a number of significant effects (impacts) on the natural and social environments. While the ICTS offers the promise of many local and regional benefits, the construction and operation of such a system would have some temporary and permanent adverse environmental effects.

The purpose of this section is to identify, during the construction and operations stages, the extent of any negative or undesirable environmental impacts associated with the ICTS proposal. These impacts were identified by other studies (see Appendix 2) and are discussed below.

5.1 Biophysical Impacts of the Proposed Undertaking

5.1.1 - AESTHETICS

General

The elevated ICTS guideway is an imposing structure that will alter the visual aspects of its immediate surroundings. While some will consider the guideway to be visually objectionable, perceptually the degree of visual intrusion is subjective, based on individual attitudes and preferences.

Construction Impacts

Construction of the ICTS facility would impose a number of temporary aesthetic impacts on local residents. Nevertheless, any visual intrusion and disruptive effects caused by earthwork or the movement of heavy construction equipment and other construction activities, are considered temporary impacts. With appropriate construction scheduling and sequencing, the effects of these impacts can be minimized.

To ensure ICTS integration with the urban environment, it would be necessary to preserve existing amenities, wherever possible, during construction. Also, in terms of form and type of building materials used, all proposed structures will have to be designed to blend into adjacent land uses. Landscaping with trees and shrubs is planned for station entrances, station peripheries and along the route to help offset visual intrusion. A description of the construction activities and the duration of impact associated with these activities is given in the Functional Plan.

Operations Impacts(11,31)

During the operations stage, the visual intrusion posed by the guideway along the selected alignment will take one of two forms: a) views of the structure, and b) views from the trains.

In the first case, the neighbouring property owners would be affected by the appearance of the structure and the shadows cast from it.

The number of dwellings on the proposed alignment (within 30 metres of the guideway), that will experience loss of privacy, total 89 units. In addition, three hotels will also experience similar problems. Fifty-one residential units located within 15 metres of the guideway will have some views from some windows disrupted as a result of the addition of the guideway.

While it will be difficult to minimize the degree of visual intrusion caused by an elevated guideway, the judicious use of visual barriers, such as fast-growing vegetation, coupled with pleasing architectural presentation will serve to help integrate the guideway with existing streetscapes.

In routing the ICTS guideway down the median of major arterial roads, it would be possible to reduce the shadowing effects on neighbouring residential areas. In addressing this problem, shade diagrams were prepared(32) which indicated that shadowing would be primarily limited to the pavement area of road surfaces during the summer months, while during other times of the year, shadows would fall on front yards in some localities during the morning and evening hours. Areas sensitive to shading would have to be accounted for in designing and locating the ICTS guideway.

With respect to views from the train, some homeowners have expressed some concern about the loss of privacy in their front yards and back yards because of an elevated transit service.

A more detailed discussion of privacy and aesthetics is given in Chapter 7 - Urban Integration of the "Functional Plan" and Task A-4 Detailing of Shortlisted Alternatives, Planning, Volume 1".

5.1.2 - AIR QUALITY

Construction Impacts(33)

Depending upon the type of construction equipment used, the type of construction techniques employed, and the ambient air quality, construction emissions including: dust, fumes, carbon monoxide, nitrogen oxides, sulphur dioxide, etc., will temporarily impair air quality along the route. The areas most affected by construction emissions are existing residences along the route.

Although actual concentrations of construction emissions are not known, it is possible, for given climatic conditions, to estimate theoretical downwind concentrations of these emissions as a percentage of concentrations at the source. By combining this information with wind frequency data, the frequency of occurrence of impairment of air quality can be estimated.

Table 5.1 indicates, for each side of each route segment, the frequency with which the concentrations at existing residences exceed 50% of the concentration at the source, and the number of residences affected. For this analysis, residence counts include: single family houses, individual units of multiple unit housing and apartments facing the street on the first three floors. To simplify the analysis only those residences with frontage directly on the alignment have been considered.

Impairment of air quality will extend beyond the first tier of residences, decreasing gradually with distance from the source, and will be much less severe at the second tier of houses than at the first. Relative differences in impairment of air quality between segments or sides of segments will be similar at each tier of houses. It should be emphasized that any zeros which appear in Table 5.1 (with respect to construction emissions) do not imply the absence of an impact. Rather they indicate that for the given climatic and wind conditions, concentrations of construction emissions at the residences should never exceed 50% of the concentration at the source.

On the lower plateau, residences along the alignment are already severely impacted by noise and traffic emissions. These residences were not counted since it is considered unlikely that sufficient use is made of balconies or outdoor recreational areas to significantly increase this existing impact. In any case, the relative impact of construction of ICTS should be much less than on the upper plateau.

The total number of residences affected in the first tier by dust, fumes and odours from construction activities has been estimated to be 106. Of this number, 32 residences will be affected by concentrations of construction emissions which could exceed 50% of the concentration at the source. Concentrations of construction emissions at the remaining 74 residences should not exceed 50%.

Appendix 7 outlines the ambient dispersion assumptions used to estimate the relative impacts presented in Table 5.1. Given detailed information on the emission rates of construction equipment and vehicles and the nature, extent and duration of construction activities, it would be possible, through the use of computer modelling, to make a quantitative estimate of the impairment of air quality.

In order to minimize construction-related air quality impacts, notably dust generation, it will be necessary to sequence construction so that heavy construction vehicles are confined, where possible, to surfaced or surface-treated roads. Earth excavation, as well as bulk loading and dumping operations, should not contribute significant dust volumes because the high moisture content of most soils tends to mediate dust generation.

TABLE 5.1 P

		SEGMENT							
		K (Partial)		E1B		E1/G1		G2 (Partial	
		C	O	C	O	C	O	C	
Increased Emissions Dust, Fumes and Odours from Construction Activities	Side of Street East	32/0%	NA	26/62% 18/0%	NA	1/62% I/0%	NA	NA	
Measurement: Number of Residences or I (already Severely Impacted)/% of Time 50% Source Concentration Exceeded	West	3/31% 32/0%		18/0%		1/31% I/0%		NA	
	North	NA		NA		NA		I/0%	
	South	NA		NA		NA		I/0%	
Increased Emissions Dust, Fumes and Odours from Operation Activities	Qualitative -3 to +3	NA	U(-1/L)	NA	U(-1/L)	NA	U(-1/L)	NA	U(-
Traffic Emissions (Increased)	Qualitative -3 to +3	-1/S	0	-1/S	0	-1/S	0	-1/S	
Ozone Emissions (Increased)	Qualitative -3 to +3	0	0	0	U(0)	0	0	0	
Hydro Emissions (Increased)	Increase in Power Consumption %	0	1%	0	1%	0	1%	0	

TENTIAL ENVIRONMENTAL IMPACTS: AIR QUALITY

CBD OUTER LOOP

Hughson To Augusta		Hughson		TH&B		CATHARINE		KING WILLIAM TO JOHN		KING WILLIAM TO JAMES		JAMES		KING		MACNAB TO MAIN		MACNAB TO TH&B	
C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O
4/62%	NA	I/0%	NA	NA	NA	I/0%	NA	NA	NA	NA	NA	I/0%	NA	I/0%	NA	I/0%	NA	NA	NA
24/0%																			
12/31%		I/31%		NA		I/31%		NA		NA		I/31%		NA		I/31%		NA	
12/0%																			
NA		NA		I/0%		NA		I/32%		I/0%		NA		I/32%		NA		I/32%	
NA		NA		I/33%		NA		I/0%		I/33%		NA		I/0%		NA		I/33%	
NA	U(-1/L)	NA	U(-1/L)	NA	U(-1/L)	NA	U(-1/L)	NA	U(-1/L)	NA	U(-1/L)	NA	U(-1/L)	NA	U(-1/L)	NA	U(-1/L)	NA	U(-1/L)
-1/S	0	-1/S	0	-1/S	0	-1/S	0	-1/S	0	-1/S	0	-1/S	0	-1/S	0	-1/S	0	-1/S	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1%	0	1%	0	1%	0	1%	0	1%	0	1%	0	1%	0	1%	0	1%	0	1%

For dust control in other situations, however, the following precautions should be exercised:

a) construction materials should be handled and/or processed only in designated sites;

b) construction materials should be moistened prior to crushing;

c) the degree of disturbance to vegetation cover should be minimized;

d) water and other non-toxic solutions should be used for dust control on roads and all exposed soil areas;

e) disturbed areas should be vegetated promptly after construction to minimize the duration of soil exposure;

f) disturbed surfaces should be protected through the judicious use of surface cover mulches, paving materials and soil binders.

Traffic Emissions During Construction

If temporary re-routing of traffic is required during construction, increased traffic emissions in the affected areas can be expected to have at least a minor impact on air quality which has not been estimated to date.

Operations Impacts

Operation of the ICTS would have no significant adverse impact on air quality. In fact, should the system become operational, the majority of buses now utilizing the central mountain access roads will be re-routed to mountain rapid transit stations. Thus, a reduction in automobile traffic congestion on major arterial roads can be expected as public transit ridership increases. As a result of these reduced local traffic volumes, there will likely be a reduction in the associated high concentrations of carbon monoxide, nitrogen dioxide and hydrocarbons, particularly on the mountain access roads and in the downtown.

The effect of the system on emissions from hydro electric stations has been examined. ICTS is expected to consume approximately 1100 Kw of electricity during the peak hour, while approximately 3-4 Mw is being allocated in the design of the system. This will amount to an increase in power consumption by Hamilton Hydro of less than one percent. On this basis, no significant impact is expected from increased hydro emissions.

The potential impact of ozone has also been considered. Because ozone is thermodynamically unstable and disperses rapidly in the atmosphere, ozone emissions from ICTS electrical components are not expected to cause measureable increases in ozone levels in open spaces. In tunnelled sections, where dispersion is more limited and where conditions may be somewhat more stable, measureable increases in ozone levels could occur. There is no reason to assume, however, that ICTS ozone emissions should differ materially from conventional subway systems.

5.1.3 - CLIMATE

Construction and Operations Impacts

Although the proposed ICTS is not expected to affect macro-climate patterns, certain micro-climate effects are anticipated. These include changes attributable to:

a) vegetation clearing, and
b) structural interference.

In either case, the elevated guideway and stations could affect wind velocities, shading (sunlight levels) and rain penetration.

Because the elevated guideway could increase wind velocities locally, it may create problems with snowdrifting and wind loadings on roofs, in some specific locations. A study to identify possible problem areas and mitigative measures necessary to reduce these impacts should be undertaken in the final design phase.

5.1.4 - FISH AND WILDLIFE

Construction Impacts

Fish and Wildlife concerns were considered on the basis of aquatic, terrestrial and avian habitats and their respective faunal composition.

There are no aquatic habitats within or adjacent to the proposed ICTS alignment. Thus no associated impacts will occur.

Nonetheless, the ICTS proposal is expected to have minor impacts on terrestrial and avian habitats associated with removal of browse and cover. These impacts have been documented in the reports, "Task E.2 - Description of the Natural Environment Along the Route Alignment Alternatives" and "Task E.3 - Description of Impacts on the Natural Environment Along Alignments W, X, Y, and Z".

Operations Impacts

Operations of the ICTS is not expected to have any adverse impacts on fish or wildlife.

5.1.5 - HYDROLOGY AND DRAINAGE IMPACTS

Construction Impacts

During the construction phase, no serious ground water impacts are envisaged, considering the relatively shallow depths of excavation required for foundations. Nevertheless, seepage into excavations may have to be controlled by the provision of sumps and conventional pumping techniques.(34) This could have some short-term impacts on local aquifers.

Although the necessity for more positive dewatering methods (well points) are not anticipated, such measures may be needed, depending on local site and ground water conditions. If incurred, the associated impacts should be minimal since there are no known well points operating along or adjacent to the alignment.

In terms of groundwater quality, the predominant movement of water through the study corridor is overland flow, the majority of which outlets to the local storm sewer network. Infiltration is limited somewhat because of the concentration of existing development. As a result, only minor groundwater impacts are anticipated.

The guideway is expected to affect precipitation patterns locally because precipitation intercepted by the structure would be diverted to local storm sewers. This impact is considered minimal considering that ICTS is to be located primarily within the road allowances.

The volume of runoff from ICTS and its ancillary works, such as stations, control yards and parking areas would vary depending on rainfall intensity and ground absorption of precipitation. This runoff should be safely disposed of with the provision of adequate stormwater services.

Because construction of the guideway, for the most part, will be localized to the location of support piers and ICTS stations, the project is unlikely to cause serious disruption to local aquifers or cause serious groundwater impairment. Soils in the corridor are rich in clays and silts which should limit infiltration, thereby minimizing the impact of sediment loading of the groundwater.

Nevertheless, exposed slopes and drainage channels should be protected by mulch, temporary seeding and mulch or sodding to reduce suface erosion. Permanent vegetation cover should also be provided on all final slopes and the use of sediment traps, rip-rap or gabions on finished embankments should be considered for erosion control.

Accidential contamination of groundwater by road salts, oil and other construction materials poses the most serious threat to the quality of groundwater in the area. In order to reduce the potential of this impact to a minimum, it will be necessary to implement stringent materials handling and storage policies during all phases of the construction.

Further elaboration on Hydrology and Drainage impacts are contained in Task E.2 and E.3 reports.

Operations Impacts

Assuming materials used to operate and maintain ICTS are handled and stored properly, operation of the ICTS is not expected to have any adverse hydrological or drainage impacts.

5.1.6 - GEOLOGY

Construction and Operation Impacts

The impacts of the proposed undertaking on geology are potentially significant during the construction and operation phases of the ICTS project. Principal impacts relate to geologic processes, bedrock, structural and strength properties, as well as, slope stability of bedrock and soils. These impacts are identified and discussed in more detail in the Task E.3 report and investigations undertaken by the Trow Group (Task B-1 report).

In the area of the Escarpment, steep slopes coupled with complex, faulted bedrock formations and unstable talus deposits will pose special constraints to tunnelling and construction. Together, these conditions make the Escarpment, and the areas of talus contiguous to its base, problematic zones in terms of potential rock slides and differential talus movements. As a result, near the Escarpment as elsewhere, special consideration must be given to the installation of rock-contact structures, including the design of foundation and tunnel structures.(34)

Although the available data base does not permit a comprehensive analysis of geological constraints, preliminary investigations conducted to date, suggest few problems of a geotechnical nature in the upper and lower plateaus.(35) Though subject to further site-specific testing and analysis, the bedrock, in terms of structural and strength properties, appears suited to the construction of the ICTS.

5.1.7 - SOILS

Construction Impacts

The impacts of the proposed undertaking on soils are perceived primarily as construction related. While the majority of the soil impacts are expected to be short-term, some may extend over the duration of the construction phase. Among the soil impacts considered significant are soil erosion and slope stability. These impacts are identified and discussed in more detail in the Task E.2 and E.3 reports and studies undertaken by the Trow Group.

During the construction phase, potential environmental impacts resulting from soil erosion could result from a number of activities, including: road widenings, excavation for piers, area grading and stockpiling of soils. All these activities must, therefore, be carried out and scheduled to reduce sediment loadings to local drainage courses and municipal storm sewers.

Most soils in the study corridor, if denuded of existing vegetation cover, or exposed to the elements for prolonged periods of time, are susceptible to wind and water erosion. For the most part, the finer soil fractions (i.e., clays and silts) would be vulnerable to wind erosion; whereas the coarser soil fractions (i.e., fine to medium sands) would be vulnerable to water erosion.

Accidential contamination of soil by salts and petroleum products may occur during construction.

In order to minimize the adverse effects of soil erosion, some of the following mitigative measures could be applied on a site-specific basis:

a) minimize the degree of vegetation disturbance;

b) revegetate disturbed soils to minimize the duration of soil exposure;

c) provide interception and diversion works to ensure safe disposal of runoff;

d) protect disturbed soils through applications of surface cover mulches and soil binders;

e) restrict trucks and other construction equipment to gravel or paved roads.

With respect to slope stability, the most problematic soils in the study area are the talus deposits situated along the base of the Escarpment. Typically a marginally stable material, these deposits are subject to differential movements, therefore, special construction techniques must be employed.

Operations Impacts

Operation of ICTS is not expected to pose any adverse environmental impacts on soils. In fact, in some localities, the existing soil condition may improve with the landscaping schemes being considered for ICTS.

5.1.8 - TOPOGRAPHY

Construction Impacts

Should they occur, the greatest impact on topography would be in the area of the Niagara Escarpment. Steep topographic slopes, coupled with unstable geologic formations require special treatment in terms of foundation and tunnelling design. In addition, the approaches to the lower portal may have to be modified to facilitate ease of entry to the lower tunnel section.

Considering that ICTS is designed to operate on steeper grades, and that tunnelling, as opposed to a surface alignment has been proposed through the Escarpment zone, the need for extensive grade modifications is reduced. Thus, it may be possible to construct the system without adversely affecting existing views and vistas of the Escarpment. In all other areas, alterations to topography, except possibly in the area of the approaches to the lower tunnel portal can be kept to a minimum.

Operations Impacts

The operation of ICTS would pose no adverse impacts to the topographic characteristics of the selected ICTS alignment.

5.1.9 - VEGETATION

Construction Impacts

Vegetation impacts would occur during the construction of ICTS. The primary impacts, in this case, are the removal of mature (irreplaceable) trees and immature (replaceable) trees and shading of existing trees by the ICTS guideway.

By and large, most impacts occur within the right-of-way on public lands. This does not, however, decrease the significance of the impact to the adjacent land owners, many of whom have tended these municipal lands for years, and in all likelihood, experience a sense of ownership.

The selected route for ICTS will require the removal of the greatest number of mature trees as compared to the alternate routes, primarily in the vicinity of the lower tunnel portal at the base of the Escarpment.

Forty years ago, this area of the Niagara Escarpment was a major transportation corridor for the Incline Railway linking Upper James Street to James Street South. A wide swath of trees was originally cleared from this area, but with the demise of the railway the trees have regenerated and are now reaching maturity. Because of the instability of the talus slope, resulting in shallow rooting of the trees, large specimens are relatively uncommon on the Escarpment. Usually, as these trees approach maturity they begin to topple over, to be replaced by those in the understory. As a result, the vegetative process is quite dynamic.

The types of impacts anticipated are discussed, and their magnitude is given in Table 5.2. A description of these impacts follows:

1. Impacts to trees greater than or equal to four inches in diameter at breast height (dbh) resulting in their:

   a) removal;
   b) possible need for removal; and
   c) root severing and delimbing or root severing and shading or all three.

   Damage to trees in this diameter class has been designated separately because replacement or transplanting is not considered as a viable measure owing to costs and obtainability.

   Item 1a, refers to trees which will definitely be removed; whereas 1b refers to trees at the edge of the guideway which may need to be removed depending upon the final design of the ICT System. Item 1c, also refers to trees at the edge of, or adjacent to the guideway. Although not subject to removal, the physical impact may well retard their vitality and/or deform their appearance. Impacts such as root severing either alone, or in conjunction with delimbing and/or shading will definitely reduce the tree's longevity.

TABLE 5.2 POTENTIAL ENVIRONMENTAL

			SEGMENT							
			K (Partial)		E1B		E1/G1		G2 (Partial)	
			C	0	C	0	C	0	C	0
Trees 100mm	Removed	Number/% of Existing	2/100	0	61/(-3)		11/(-3)	0	2/100	0
	Possibly Removed		0		0		0		0	
	Root Severed/Delimbed/Shaded		0		0		6/(-3)		0	
	Shaded	or	0		0		0		0	
Trees 100mm	Removed		4/100		(-3)		5/(-3)		4/100	
	Possibly Removed		1/20		0		0		0	
	Root Severed/Delimbed/Shaded		1/20				0			
	Shaded	(Qualitative 0 to -3)	0				0			
Shrubs	Removed						11			
	Possibly Removed	Number					0			
	Shaded						0	5		
Hedges	Removed	Number/Meters					0	0		
Lawns/Grassed Areas Removed			-1				-2			
Ground Flora Removed		(Qualitative 0 to -3)	0		-2		0			
Visual Impact to Street Scape			0		-2		-3		-1	

IMP CTS: VEGETATION-ALIGNMENT W

CBD OUTER LOOP

Hughson To Augusta		Hughson		TH&B		Catharine		King William To John		King William To James		James		King		MacNab To Main		MacNab To TH&B	
C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O
9/69	0	3/75	0	(-1)	0	0	0	0	0	0	0	0	0	4/100	0	3/100	0	4/25	0
0		0		0										0		0		0	
0				0										0		0		0	
0				0										0		0		0	
1/7				(-1)										2/100		4/100		5/50	
0				0		1/100								0		0		0	
						0													
	6/40																		
	0																		
-3				-1										-1		-2		-1	

In all instances, impacts in category 1 are considered long term because of the non-replaceability of the trees.

2. Impacts to trees less than four inches (dbh) resulting in their:

   a) removal;
   b) possible need for removal; and
   c) root severing and delimbing, root severing and shading or all three.

   Explanation for 2a, b and c are the same as in category 1, however, trees in this diameter class are considered replaceable and as a result the impact is short term.

In categories 1 and 2, an actual count[1] of the trees affected and unaffected was taken. Based on this data, a quantifiable impact was determined as presented in Table 5.2. Thus, the denotation 3/13 for category 1a would be read as: three trees representing 13% of all trees greater than or equal to four inches would be removed for the segment evaluated.

Along the proposed alignment, a total of 99 trees with a diameter at breast height of four or more inches must be removed. An additional six trees in this size category may be shaded, delimbed or have roots severed.

As well, a total of 26 trees with a diameter at breast height of less than four inches must be removed. One additional tree may have to be removed or will be shaded, delimbed or have roots severed. Six more trees may be shaded.

---

1) Counts include all trees within the proposed guideway corridor and those between the edge of the guideway corridor and the adjacent building face.

3. Impacts to shrubs resulting in their:

   a) removal; or
   b) possible need for removal;
   c) shading.

   Owing to the large number of shrubs used for landscaping purposes, a count of only those being affected was made. This loss of vegetation is considered minor both from an aspect of aesthetic degradation and the low cost of compensation or replacement. Further, most of the shrubs subject to removal, although planted by the adjacent land owner, are on municipal land. By and large, shrub removal constitutes less than 10% (visual estimate) of the existing landscape shrubs. Because this vegetative loss is replaceable, the impact is considered short term.

4. Impacts to hedges resulting in their removal.

   This has been quantified in terms of the number of hedges removed and the corresponding length (in metres). The number of hedges removed represents the number of dwellings affected. Because this vegetative loss is replaceable, the impact is considered short term.

5. Loss of lawns or grassed areas has been denoted qualitatively to represent the relative degree of impact among segments. A scale of 0 to -3 has been used, where 0 is a Nil impact and -3 is severe. Because the grass is not likely to be replaced, the impact is considered long term.

6. Loss of ground flora refers to flora other than trees, shrubs and grasses found in the urban areas. In particular, it pertains to the natural areas along the escarpment. This impact is expressed qualitatively on a scale of 0 to -3 used in category 5. The impact would be long term.

7. Visual impact to the streetscape as a result of vegetation removed. This is, in essence, a summary of the overall effects expressed qualitatively (0 to -3) to show relative differences among segments.

8. Shading of trees and shrubs for a period of two hours or longer than that now experienced. This is a long term impact, the effects of which although subtle, are nevertheless deleterious. This impact has been presented quantitatively for trees (Table 5.2) and is expressed as a percentage of the existing trees. Once again, the categories of trees greater than or equal to four inches dbh and less than four inches dbh have been used.

   With respect to shrubs, a numerical value has been given for those removed. A total count was not considered appropriate because of the minor nature of the impact which can be readily mitigated against by replacement of the shrubs.

   Eleven shrubs will have to be removed from along the alignment. An additional five shrubs may be shaded after the construction of the guideway is completed.

   There are other indirect impacts which could be considered; however, these would require more detail on the design aspects of the ICT System. Some worthy of consideration are soil compaction over the root zone, fuel spills in vegetated areas, and excessive dust accumulation on vegetation.

The majority of all trees subject to shadowing from the ICTS guideway are small (Table 5.2) and, therefore, most could be relocated or replaced.

The landscaping component for ICTS will have a substantial effect on improving the aesthetic quality of the selected alignment and is addressed in the Functional Plan.

Operations Impacts

Operations of ITCS is not expected to impact any sensitive vegetation anywhere along the final alignment.

5.2 Socio-Economic Impacts of the Proposed Undertaking

5.2.1 - LAND USE IMPACTS

General

Transportation and land use are strongly interrelated. The achievement of the development objectives enunciated in the Regional Official Plan is dependent on providing the level of accessibility necessary to support and promote the desired urban form and structure. Conversely, the successful implementation of major transit facilities is dependent on introducing and supporting land use and zoning policies in the transportation corridor.(36)

Property Requirements for ICTS

For the most part, the ICTS route is located along municipal rights-of-way. However, in some instances, the use of private commercial property is necessary. No residential acquisition is envisaged. Acquisition is necessary, primarily at station locations, to make room for primary and ancillary facilities and where existing buildings interfere with the location of guideway. For the chosen route, property acquisition is minimal.

Because the ICTS is elevated, it is not always necessary to acquire property rights. For some commercial property owners, some easements to facilitate column placement and provide guideway access may be desirable. In establishing easements, emphasis is placed on integrating ICTS with the existing streetscape and land use.

On the selected alignment, disruption to existing land use would include five commercial businesses and approximately 4.0 acres of parking space. As well, some temporary construction easements and permanent easements will be required. Whereas, the impact resulting from land use displacement cannot be avoided, it can be reduced through considerations in design, column and station location and easement selection.

Figure 5.1 identifies potential areas along the selected alignment where property acquisition and easement agreements may be required.

Property Impacts(11)

The assessments of the specific impacts of the Hamilton ICTS are based on descriptions of the system as supplied by Metro Canada Ltd., and interpretation of the conclusions of the literature review as applied to Hamilton.

The impact areas have been defined as follows:

- locations within an average radius of 1 000 feet of a transit station;
- locations immediately facing or backing onto the guideway;
- other areas within visual distance of the ICTS.

It should be noted that the impacts are described in general terms. A number of specific properties affected by the alignment are the subject of specific discussions/negotations between the Region and the owners, and have not been dealt with. The exception is that a general assessment of the impact of the operation of the system on the two plazas on the Mountain (Mircle Mart Plaza and Mountain Mall Plaza) has been included.

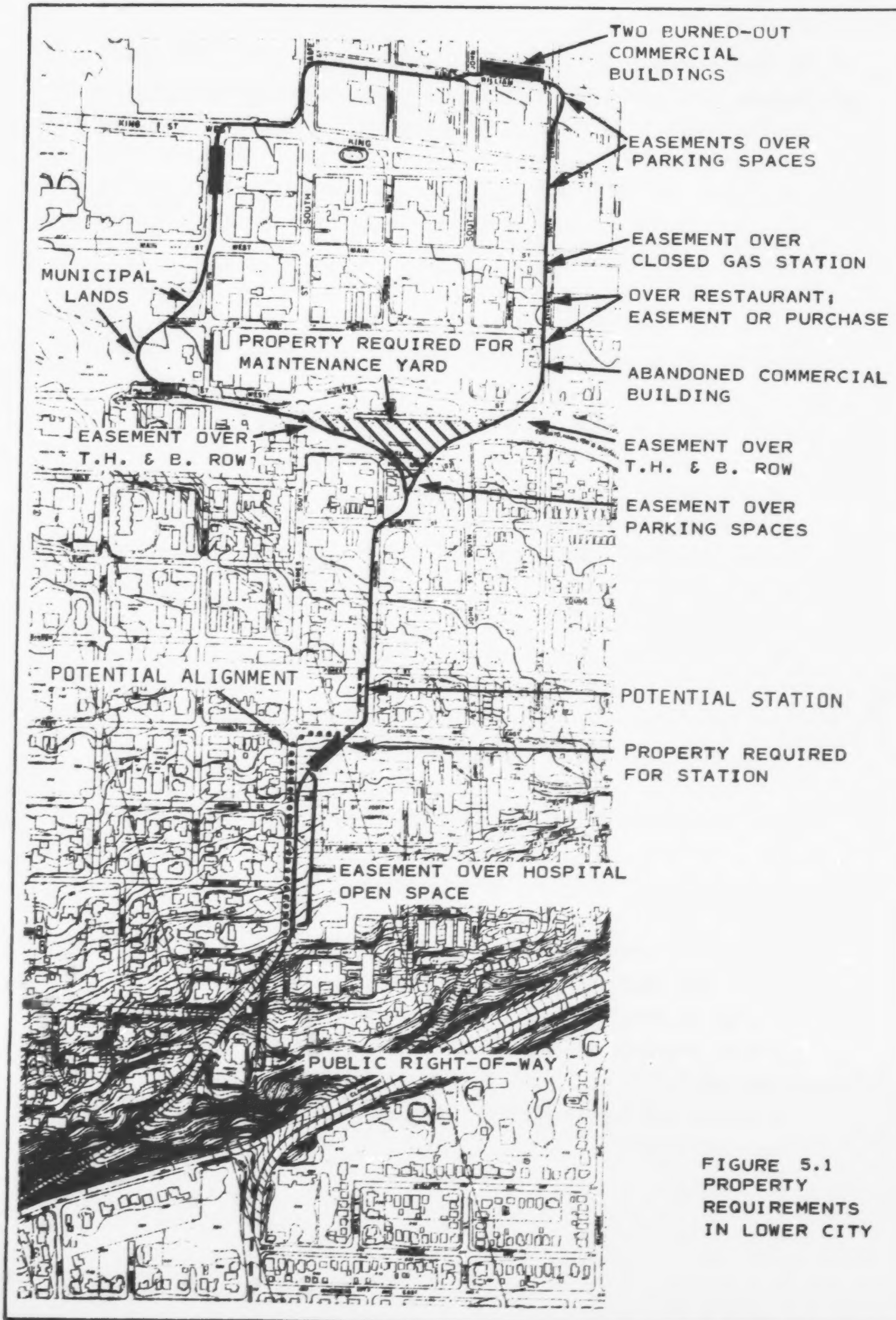

TWO BURNED-OUT COMMERCIAL BUILDINGS
EASEMENTS OVER PARKING SPACES
EASEMENT OVER CLOSED GAS STATION
MUNICIPAL LANDS
OVER RESTAURANT; EASEMENT OR PURCHASE
PROPERTY REQUIRED FOR MAINTENANCE YARD
ABANDONED COMMERCIAL BUILDING
EASEMENT OVER T.H. & B. ROW
EASEMENT OVER T.H. & B. ROW
EASEMENT OVER PARKING SPACES
POTENTIAL ALIGNMENT
POTENTIAL STATION
PROPERTY REQUIRED FOR STATION
EASEMENT OVER HOSPITAL OPEN SPACE
PUBLIC RIGHT-OF-WAY
KING ST
MAIN ST
SOUTH
JOHN
JAMES

FIGURE 5.1
PROPERTY
REQUIREMENTS
IN LOWER CITY

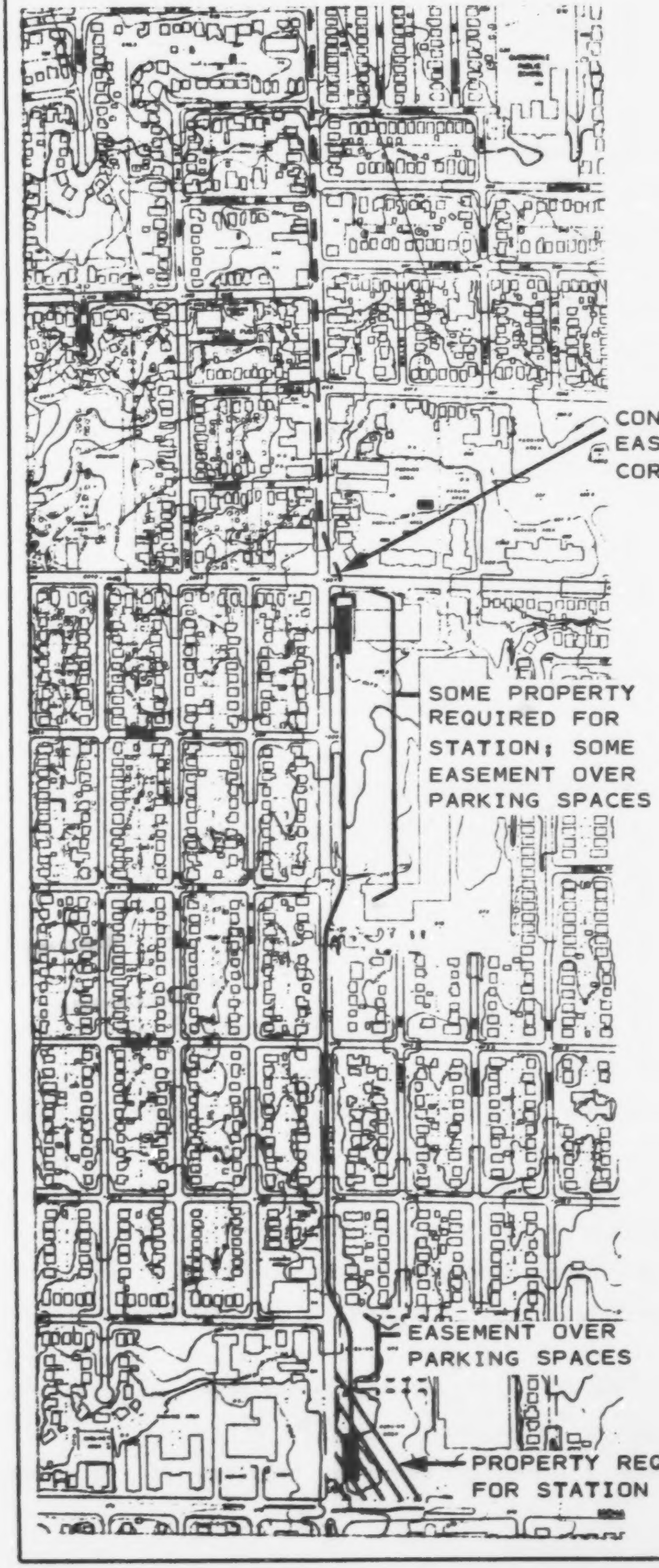

CONSTRUCTION EASEMENT AT CORNER
SOME PROPERTY REQUIRED FOR STATION; SOME EASEMENT OVER PARKING SPACES
EASEMENT OVER PARKING SPACES
PROPERTY REQUIRED FOR STATION

FIGURE 5.1 CON'T

PROPERTY
REQUIREMENTS
ON MOUNTAIN

Construction Impacts(46)

Construction impacts will have an effect along the route; but are not generally rated as severe. They will be mitigated by the prefabricated form of construction. In general, impacts on residential properties will be no more severe than roadworks which are undertaken from time to time. The impact of station construction on the two plazas will be little different from those associated with an expansion of a plaza.

In the downtown area the most significant effects are the disruption of the transit access and the normal flow of workers and shoppers to the immediate vicinity of the MacNab Street South terminus, and hence access to Jackson Square, Hamilton Place, the Municipal offices and businesses in the immediate vicinity.

A further area of significant disruption is likely to occur during the construction period along Catharine Street South between King Street East and Main Street East. In this location, the guideway would travel through the parking lot of the Royal Connaught Hotel, which is reportedly substantially underserved with parking relative to the hotel's requirement.

Post Construction Impacts: Residential(46)

Impacts are identified relative to two demand scenarios: one which assumes significant future demand for residential properties, and the other low future demand. Impacts are concentrated within 1 000 feet of transit stations. Property values are expected to rise as a result of the willingness on the part of purchasers to pay a small premium (up to 10%) for proximity to a transit station. It is also likely that speculation on higher densities being permitted in the vicinity of transit stations will result in higher values. The extent to which these will be sustained will depend on the actual zoning that is approved and market demand. It should be noted that because the areas concerned are occupied by existing single family dwellings, a very substantial increase in density would be required if redevelopment were to be worthwhile. Substantial increases in density would only be justified in the significant market demand scenario.

It should also be noted that if community pressure resulted in no change in zoning, only the effect of purchasers being willing to pay more for proximity to the station would be felt. This could be reduced somewhat because of nuisance from traffic generated by the transit station, although this effect should be less severe than was noted with the Bay Area Rapid Transit (BART) system.

Along the alignment between stations, experience elsewhere(*) has shown that values, unexpectedly, would not be depressed. In the integrated planning of the line, it has been suggested that a commercial zoning for fronting properties could be considered. This would result in value increases for those properties; but small decreases for properties which back onto the new commercial zoning.

Effects on the eight apartment blocks along Hughson Street are expected to be limited to a loss in privacy for units on the first, second and third floors that face the guideway. Rental appreciation for such units is likely to be lower than that for other units in the blocks.

Post Construction Impacts: Commercial(46)

Miracle Mart Plaza and Mountain Mall Plaza

Impacts on the two plazas are regarded as potentially positive since:

1. Increased density or residential development in the vicinity of transit stations could lead to population increase, and hence increased spending and possible justification of existing space.

(*) Review of literature on San Francisco's BART, Washington Metro, the Boston System especially the Red Line Extension, Montreal Metro, Toronto Subway and the Philadelphia - Lindenwold High Speed Line.

2. Providing that the operational arrangements of the system permit stopover on transfer from ICTS to bus, $500 000 to $1 million increased sales could result in the two plazas possibly justifying construction of 4 000 - 8 000 square feet of additional space.

In order to capitalize on the potential increased market it will be necessary for the appropriate approvals to be given, possibly making allowance for a reduced parking standard, on the basis of improved transit access. Since the stations are proposed on the car parks of the plazas, it will be seen that the station locations provide an excellent example of the need for integrated planning involving the transit authority, the City, and the private sector.

Central Business District(46)

Studies on transit systems in North America suggest that rapid transit is a potentially important inducement to intensified development near stations in the CBD. Other factors contribute to the intensification, notably availability of developable sites; availability of suitable zoning; and investments by local government. Paramount in the realization of any development is, however, the level of market demand. Further, the importance of a co-ordinated plan that involves the transit authority, the local government, and the private sector is emphasized.

In the CBD of Hamilton, which will be served by the transit loop, there are numerous developable sites, currently occupied by parking lots or older low rise buildings. Zoning would permit over ten times the space that is currently developed. The City continues to pursue an active downtown investment and development program focused on Lloyd D. Jackson Square. Thus, many of the basic prerequisites of intensified development are already in place.

The question of demand is more difficult to address; but may lie in the range of 4-6 million square feet by 2001.

Interviews with the private sector do not suggest that a period of rapid growth is imminent. There was a general concensus that the ICTS would do little to improve overall accessibility to the wider region. As a result, both local and national concerns expressed a reluctance to associate the ICTS with added impetus for new commercial/retail/service industry development in the central area.

Notwithstanding this, developers recorded considerable interest in the routing and station location in the downtown loop. The view expressed was that the loop was too small. Concerns about the way in which the elevated construction would/could be integrated with existing and new development were identified. The need to connect directly into the proposed arena/trade centre was also pointed out. The desirability of consultation with the private sector in resolving these and similar issues was emphasized.

The interview program provided ample support for the view from other studies that a co-ordinated planning effort involving the private sector is essential. The intensification of development referred to in other studies is the private sector response to market demand. In cases such as Hamilton, where market demand could be highly variable, it would be important to involve those who will make investment decisions at an early stage if benefits are to be maximized.

More specifically, local interests pointed to development opportunities available, both in terms of land and appropriate zoning in the areas directly to the north of King William Street between MacNab and Catharine Streets. In addition, development opportunities to the north and west of the proposed arena/trade centre, west of Bay Street and north of King Street, were identified as the most desirable development locations.

In summary, construction impacts, while negative, are unlikely to be any greater than those associated with normal road construction or plaza expansion programs. Post construction impacts should generally be neutral (along the routes between stations) or positive. However, it is critical that in detailed planning that transit authority, municipal governments and the private sector co-operate to produce an integrated plan to maximize positive effects. There are many instances where the lack of one or more of the prerequisites has resulted in negligible impact, or no positive impact at all. Finally, for all apsects of impact a strong and effective market demand is of the greatest importance.

Development Potential(46)

a) Review and Evidence of Impacts From Other Systems

A systematic study of rail transit systems was made to achieve a better understanding of the potential impacts of the proposed Hamilton ICTS. It was determined that no directly comparable system is in operation. New light rail systems have not been in operation long enough for evidence of impacts to be conclusive. It has therefore been necessary to rely on impacts recorded in relation to heavy rail rapid transit systems. These have been constructed in cities/regions that are considerably larger than the City of Hamilton/the Region of Hamilton-Wentworth. This again influences the interpretation of the findings.

The most detailed studies have been made with respect to the BART system in San Francisco. Other information, which is less comprehensive, has been reviewed with respect to the Washington Metro; the Boston System, especially the Red Line Extension; the Montreal Metro; Toronto Subway and the Philadephia-Lindenwold High Speed Line.

The conclusions of the literature review have been summarized with respect to residential, retail commercial and office development.

b) Residential Development

In the pre-construction studies, expectations as to the impact of transit systems on residential developments ran high. Significant positive impacts were anticipated in the vicinity of transit stations, while negative impacts along surface or elevated rights-of-way were expected.

In the post-construction years, it has become clear that there is a potential residential land use impact associated with the implementation of a rapid transit system. However, it has also become clear that the positive impacts will only occur if the economic conditions for growth are present. Further, apartment development will only occur if, in addition to market demand zoning regulations to encourage, or at least permit, high density development are in place. Somewhat surprisingly, expected adverse impacts on the value of residences adjacent to rights-of-way have not materialized; but delays in new residential construction have ocurred, primarily due to the added cost of sound insulation where this is required by law.

Summarizing the conclusions to be drawn from the BART and other studies:

1. A significant proportion of the homeowners (20%) and developers (50%) expressed themselves willing to pay more for property/land with rapid transit access.

2. Many homeowners who currently use automobiles regarded rapid transit as an insurance against non-availability, or rapidly rising costs of gasoline.

3. Pressures for development of denser residential forms (e.g., apartments) are concentrated within 1 500 feet of stations, and development only occurs if there is demand in the marketplace and appropriate zoning is available.

4. Residential value along rights-of-way were not in practice depressed, although in cases where transit-induced traffic and parking caused nuisance, decline in values has occurred.

5. The development of new residential areas along rights-of-way has been delayed, apparently because of the added cost of sound insulation required to meet government standards.

6. Transit system impacts take a period of years to materialize.

To summarize, then, there is evidence in the literature of the economic/land use impact of rapid transit systems on residential development. At least some of the reasons for this relate to concerns regarding the availability and cost of gasoline, factors likely to be of increasing rather than declining importance in the future. However, these effects only materialize if basic economic and market conditions pertain, i.e., the economy is sufficiently prosperous to support development, and government policies and zoning regulations are supportive of new investments.

c) Retail Development

Such quantitative evidence as exists supports the view that rapid transit has a positive impact on retail land use. This is supported by qualitative observation in cities such as Toronto and Montreal. While connection to a system can have extremely positive short term impacts (a department store in Washington, D.C., which has direct access to a transit station, saw a 70% increase in customers and a 40% rise in sales within 2 years of the line's opening, and more than 50% of the store's customers now arrive by transit), in other instances impacts take considerably longer to materialize. The importance of market demand and appropriate zoning is again paramount.

d) Office Development

Recent major rapid transit developments have been important inducements to intensified development near stations, both in CBDs and outlying areas, although only when supported by other favourable forces (market demand, appropriate zoning, government investments, available land, and community support). Evidence related to light rail is as yet inconclusive.

Rapid transit results in a change in distribution of growth rather than additional net economic or population growth. However, in this context "region" should not be interpreted narrowly (e.g., Hamilton-Wentworth) but rather the wider geographic region (e.g., the Bay Area in relation to San Franscisco should be understood).

The timing of land use impacts generally seems largely dependent on general economic conditions. Five years appears to be a minimum wait for substantial impacts; but the period can be much longer.

The studies also identify the importance of co-ordination with the private sector in planning both the transit system and associated actions by local government.

Generally transit is recognized as having a positive effect on property prices and rents. However, since the effects of increased density associated with transit introduction are not included, the effects on property values seem to have been understated.

5.2.2 - EFFECTS ON HERITAGE RESOURCES

5.2.4.1 - Construction and Operations Impacts

i) Archaeological Resources

Consultations with the Ontario Ministry of Culture and Recreation, Historial Planning and Research Branch reveal that the construction and operations of the proposed ICTS would not likely impact any archaeological resources in the vicinity of the escarpment.

In the Downtown core, however, excavations could intersect historical archaeological remains pertaining to nineteenth century Hamilton. It is also possible, but unlikely that prehistoric archaeological remains could also be impacted in this area.

Construction of the proposed ICTS would have to co-ordinated with the appropriate authorities to enable the identification of significant archaeological desposits.

ii) Historic Sites and Buildings

The Local Architectural Conservation Advisory Committee (LACAC) is a citizen's committee appointed by the City of Hamilton under the Ontario Heritage Act, 1974. The purpose of LACAC is to advise the City of the identification and designation of buildings having historical or architectural value.

LACAC has prepared working lists of properties of interest, and of possible heritage conservation districts. The following list includes buildings within Hamilton which have been designated under the terms of the Ontario Heritage Act as buildings of historic and architectural value:

35-43 Duke Street
51 Herkimer Street
46 Forest Avenue
York Boulevard at Dundurn Street
Jackson Street West
17 Forest Avenue
95 Arkledun Avenue
75 Hunter Street West
51 Stuart Street
52 James Street South
63-73 MacNab Street North

Sandyford Place
Dundurn Castle
Whitehern
Rock Castle
Central School
Custom House
Bank of Montreal

All of the above, except the Custom House, 51 Stuart Street and Dundurn Castle, are within the study corridor. Of these, only Whitehern is actually along the rapid transit alignment. The ICTS guideway has been routed to minimize impacts on structures of historical and architectural value. The proposal route does not remove any buildings of historical and/or architectural value.

In addition to buildings already designated, LACAC is in the process of recommending that the following buildings be designated under the Ontario Heritage Act:

47 James Street South
116 MacNab Street South
122-126 MacNab Street South
6-12 John Street North
316 James Street South
14-16 Duke Street
13-15 Bold Street
14 Belvidere
Mercantile Bank
MacNab Street Presbyterian Church and Manse
Treble Hall
Ballanahinch
Hereford House

Of these 316 James Street South, and MacNab Street Presbyterian Church and Manse are the only buildings along the proposed rapid transit alignment. The routing of the ICTS guideway would preclude any adverse impact on these structures.

5.2.3 - IMPACTS ON TRANSIT USERS

Construction Impacts

Construction of ICTS could temporarily disrupt existing transit service at major access points and station locations. Open cut construction of the upper portal of the tunnel section will be located on Upper James Street, approximately 300 metres north of Fennell Avenue. In addition, the centre lane of Upper James Street at Mohawk Road will also be closed to traffic during construction. In order to minimize this impact, it would be necessary to maintain continuity of existing bus schedules as much as possible. Modifications to vehicle re-routing would have to be co-ordinated to minimize disruption to pedestrian mobility. The only bus route affected will be the Upper James Street route.

Operations Impacts

Because ICTS operates on an exclusive right-of-way, it is not affected by traffic congestion, traffic signals, road construction, traffic accidents and inclement weather conditions which normally serve to delay automobile and streetcar traffic. Thus, with a travel time that is virtually guaranteed from station to station, ICTS offers certain conveniences not commonly found with other modes of public transportation.

Along the alignment, ICTS will cut travel times in half. For other areas, initial travel time savings will vary from two to five minutes. As road congestion increases, so will the time savings.

As the Mountain community grows and the downtown develops, the road network and Mountain access roads will become increasingly congested and the level of service on bus routes is likely to decline. The ICTS transit service, however, will be able to maintain its normal operating schedule irrespective of prevailing road congestion problems.

Bus routes will be changed to take advantage of the rapid transit service. Bus routes on the Central Mountain and in the Downtown area will be re-organized to feed passengers directly into the rapid transit stations. Transfers between buses and rapid transit are weather protected and direct to ensure passenger comfort and convenience. Waiting time at stations for both rapid transit and surface transit will be reduced due to high train frequencies and increased level of service for buses.

5.2.4 - EFFECTS ON EXISTING TRANSPORTATION SYSTEMS

Transit currently plays an important role in the provision of transportation services between the Mountain and Central Business District. The significance of this role is reflected in the following Regional Official Plan (1980) statement:

> That a transit system with increased transit capacity receive a high priority in transportation planning in the urban areas of the Region, especially in the corridor connecting downtown Hamilton to the sub-regional centre on the Hamilton Mountain.

This policy statement was premised on the fact that the forecasted transit ridership in the corridor could be 8 000 persons per hour in the peak direction by the year 2001. It should be noted, however, that this level of transit ridership was predicated on a rapid transit system being in place on an exclusive right-of-way. The analysis was based on the assumption that without such a facility, the modal split to transit would remain relatively low and severe congestion would occur in the corridor.

The previous studies have demonstrated the desirability of a rapid transit facility in the Mountain Corridor in support of transportation service requirements. To date, road improvements have been given a higher priority for implementation because of the need to satisfy immediate development and transportation service requirements in the Region.

With rapid transit, substantial improvements to existing transportation systems could be realized.

Energy Considerations(37)

Uncertainties about the supply and cost of petroleum or fossil fuels make the Intermediate Capacity Transit System proposed by UTDC quite attractive.

Petroleum fuels represent a non-renewable resource that is being depleted at an increasing rate.

ICTS however, is an electrical transit system which therefore, provides an opportunity to reduce the current rate of depletion of fossil fuels and to develop an awareness towards energy conservation on a large scale. It also has the distinct advantage of a virtually pollution-free operation.

Electrically powered transit systems are reported to be more efficient than automobiles. The energy consumption of Intermediate Capacity Transit Systems is reported to range between 1 200 and 1 400 BTU per seat mile. Automobiles are reported to consume up to 2 200 BTU per seat mile.

Electric power costs per BTU are currently higher than the costs of petroleum. However, the gap is rapidly narrowing and in view of present trends, it is anticipated that electric powered transit vehicles will be the more economical mode within the near future.

ICTS also has potential energy conservation benefits relative to land use development. It is anticipated that the introduction of ICTS as a revenue demonstration project in Hamilton earlier than otherwise possible will act as a stimulus to the earlier implementation of land development patterns supportive of rapid transit. This includes development of higher density clusters of dwelling units such as apartments, townhouses, etc. which are more energy efficient (in terms of heating) than single family dwellings.

The effect of the system on emissions from hydro electric stations has been examined. The ICTS is expected to consume approximately 1 100 Kw of electricity during the peak hour. Approximately 3 - 4 Mw is being allocated in the design of the system. This will amount to an increase in power consumption by Hamilton Hydro of less than one percent. The impact associated with increased hydro consumption is considered insignificant.

Ridership Factors

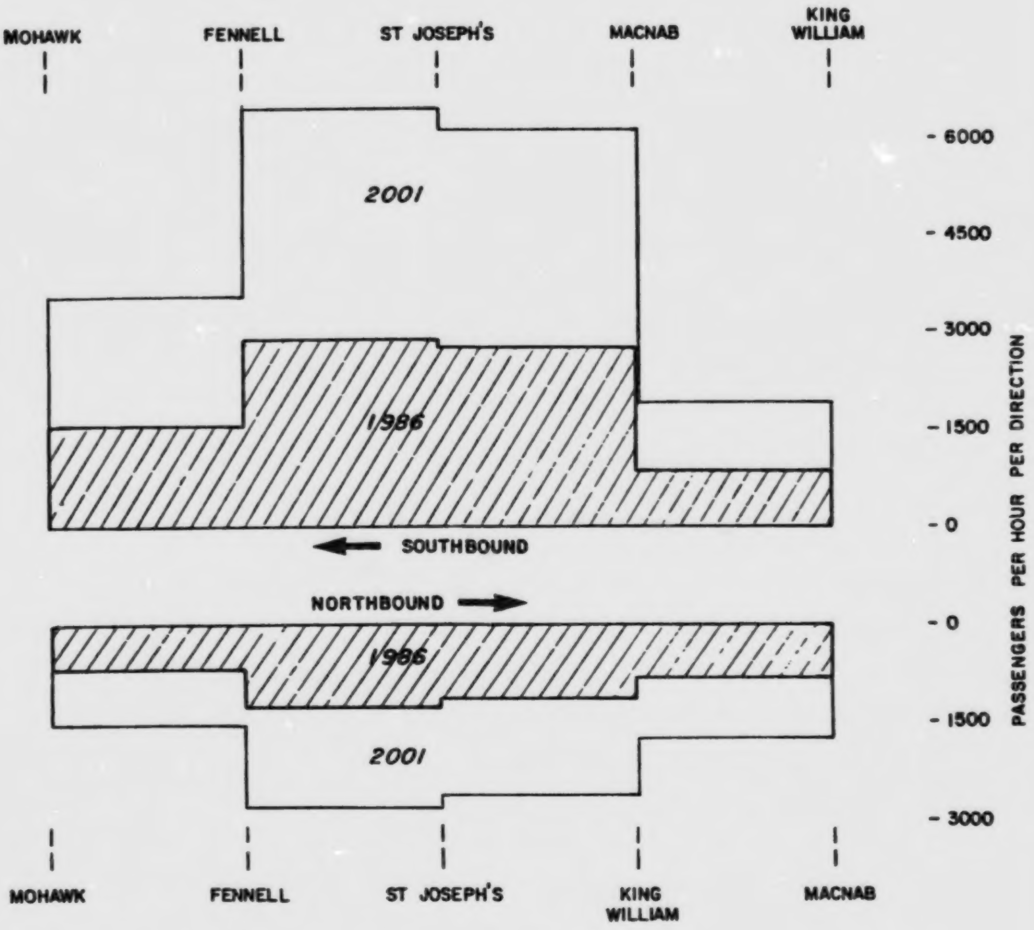
The number of transit riders using ICTS will depend on such factors as:

- increasing costs of operating a car;
- increasing traffic congestion, particularly on the escarpment crossings;
- activity centres near stations;
- population changes near stations;
- service areas of buses;
- changing public attitudes towards transit and cars; and
- population and job growth.

Minimum Ridership Estimates

The estimates shown in Figure 5.2 represent the minimum ridership to be expected on the rapid transit system. A fully utilized road system with minor widenings at the base of the escarpment has been assumed, with trips that cannot be made on the road system being assigned to rapid transit. No allowance has been made for passengers who would be attracted to rapid transit by convenient service and lower cost. This shift from autos to transit normally results in substantial ridership

FIGURE 5.2



PROJECTED P.M. PEAK HOUR
ICTS RIDERSHIP

increase above the estimated minimum. The annual ridership along the proposed alignment has been estimated to be 8 200 000 passengers in 1986 and 19 512 000 passengers in 2001.

Transit in the Mountain Corridor

The Regional Council of Hamilton-Wentworth has recognized the need to encourage transit as a viable alternative transportation mode to the private automobile.

Transit ridership crossing the escarpment in the Central Mountain Corridor now represents approximately 40% of all transit trips to and from the Downtown. As population and employment grows in Hamilton, this figure will increase. Approximately, seven million passenger trips per year now cross the Escarpment in this corridor. By the year 2001 - 20 years from now - it has been estimated that twenty million passenger trips per year will cross the Escarpment in this corridor utilizing public transit. The majority of these trips will have to be accommodated by some form of rapid transit, separated from existing roads on its own right-of-way.

Transit Interface

The number of riders on rapid transit will depend to a large extent on the convenience of transfers to and from other means of transportation. The selected ICTS alignment provides excellent service to the downtown activity centres, and includes the potential to serve the future inter-regional bus terminal. Special express bus service can also be provided along various routes to connect other major centres such as Mohawk College and the Bayfront Industrial area.

All major transfer facilities will offer weather-protected waiting areas, and free transfers between buses and the rapid transit.

Roads Interface

ICTS generally occupies an alignment confined to an existing road allowance. In most areas, flexibility with column placement exists to avoid blocking the safe movement of traffic at driveways and intersections. Areas where visibility problems may occur have been recognized. Appropriate traffic control measures would have to be applied in these areas.

Details of the impacts to traffic and the existing road network, together with details of specific segments of the selected ICTS alignment are outlined in Appendix 4 and include:

- left turn restrictions;
- decreases in existing number of lanes;
- reduction in road capacity;
- reduction in on-street parking; and
- reduction in visibility at intersections.

5.2.5 - EFFECTS ON LOCAL ECONOMIC CONDITIONS

Financial Impact on the City of Hamilton and the Regional Municipality of Hamilton-Wentworth

The capital cost of the proposed ICTS is estimated by Metro Canada Limited to be $111 million, expressed in first quarter 1981 dollars. The analysis of financial impact is based on the assumption that the local share of this costs would be 10 percent, or $11.1 million. Further, it has been assumed that although the financing of the $11.1 million would be undertaken by the Region, the City of Hamilton would actually bear the total cost burden, since the ICTS would be totally within the boundaries of the City. Operating costs have not been addressed on the understanding that the Province of Ontario has in place subsidy policies that will cover operating deficits of the ICTS over and above those that might otherwise have been incurred by an all bus system.

Two financing alternatives were analyzed:

1. a special levy which would raise $3.7 million in each of 3 years of ICTS construction (1983, 1984, 1985);

2. long term debentures, issued annually over 3 years (1983, 1984, 1985) for amounts of $3.7 million.

An assumption underlying the analysis of both alternatives is that taxable assessment in the City of Hamilton would increase at an annual rate of 1 percent over the period 1980-1999. This assumption is taken from the City of Hamilton's 5-year capital budget program (1981-1985).

It should be noted that all analysis is based on the capital cost of the ICTS in 1981 dollars. To the extent that the cost rises due to inflation between 1981 and the time of construction, the actual dollar amounts paid by taxpayers would be higher than those given in the analysis.

3-Year Special Levy

Under the 3-year special levy alternative, the $3.7 million per year levy would require a taxpayer having a home assessed at $5 000 (approximately $37 000 market value in 1981) to a pay maximum of $1.65 per month or $19.80 per year. The $5 000 level is that currently used by the Region as an approximation of the typical City of Hamilton residential assessment.

Long Term Debentures

The long term debentures alternative was analyzed for several cases of interest rate and debenture period. Interest rates were 13.5%, 15%, 18%, and 20%, and debenture periods were 10 and 15 years. Based on September 1981 conditions, the most likely case was judged to be the 10 year debenture at a rate of 18%, but the range is presented to take account of rate fluctuations. Since it was assumed that 3 debentures would be issued individually in 3 consecutive years, the debenture payments during the first and last two years of the 12 year period during which at least one debenture would be outstanding would be substantially lower than during the middle 8 years in which all 3 issues would be outstanding. The monthly payment required of a taxpayer with a home assessed at $5 000 would be a maximum of $1.08 per month or $12.96 per year.

Conclusion

In terms of monthly payments, the debenture alternative is attractive, since by spreading costs over a longer period, the immediate burden on the taxpayer is reduced. As well, once the rates and terms of the debentures were struck, the real monthly payments would decrease more dramatically than the indicated nominal decrease, due to the effect of inflation. Although inflation and inflationary expectations are in part built into the interest rate, it is important to emphasize that the real monthly payments (i.e., the value of the actual future dollars paid, expressed in 1981 dollars) would be lower once inflation is taken into account. Assuming an inflation rate of 15%, by the last year of the 10 year debenture in 1984, payments would be 10 cent dollars, based on constant 1981 dollar amounts.

However, these advantages must be weighed against those of the special levy alternative. Although monthly payments are higher for the special levy, under current interest rates (18%) the payment for debentures is approximately two thirds of that required for the special levy financing which would be completed in three years. This is an important consideration since if interest rates continue to rise, the spread between the total payments under the two alternatives will increase in favour of the special levy. Under this assumption, it might be more advantageous to discharge the debt over the shorter three year period. This would especially be the case if inflation were expected to decline markedly over the period of the debenture, for the value of future payments in 1981 dollars would thus be higher. In other words, if debenture interest rates declined, or if debenture interest rates and inflation both remain high it is relatively more attractive to debenture expenditures. If interest rates are high, but inflation is expected to decline appreciably after the date of debenture, the 3-year levy becomes relatively more attractive.

Impact on Local Income and Employment

The potential impacts of the ICTS on local income and employment were evaluated separately for two categories of expenditures:

- capital expenditures
- operations expenditures

Impacts of capital expenditures would be temporary and short term, about 3 years in the case of the proposed ICTS. Operations expenditures would generate income and employment on a continuing basis.

Impacts were estimated at two levels: direct impact and total impact. In the case of capital expenditures direct impacts would be the income flowing directly to companies (and their employees) involved in the actual construction or design of the system and the employment in these companies which was supported by the ICTS project. Total impacts would be larger since they would include not only the direct impacts but also the indirect and induced income and employment. The income and employment generated in industries which would support those businesses affected directly by ICTS expenditures (e.g., by supplying materials or equipment) are the indirect impacts. Induced impacts refer to the income and employment resulting from expenditures on consumer goods and investment by employees of the companies directly and indirectly affected by the original ICTS expenditures.

The direct and total impacts of the ICTS expenditures would not occur only in Hamilton-Wentworth. Some income and employment would be created in other areas of the Province or even outside the country. However, where possible, the potential magnitude of the impacts falling within Hamilton-Wentworth alone are indicated.

a) Impacts of Capital Expenditures

According to Metro Canada Limited estimates, total direct employment in Hamilton-Wentworth would be about 1 418 person-years, representing 87% of the total direct employment on the project (1 625 person-years).

Most of this employment, about 1 254 person-years, would be in the construction trades, with another 154 person-years in engineering and architecture and project administration. If one assumes that this employment is spread over 3 years, then the average number of people employed in Hamilton-Wentworth on the ICTS project would be 418 persons in the construction trades and 51 persons in engineering and project administration. The actual number of persons having some employment on the project would actually be greater than this since not all persons would work for the full 3 years.

The estimates should be regarded as the maximum amount of work available to local residents, since they are based on the following assumptions:

- architectural and engineering contractors will be Hamilton-Wentworth based;
- construction contractors will be Hamilton-Wentworth based;
- suppliers of pre-cast concrete sections will base their operations in Hamilton-Wentworth.

These are reasonable assumptions from the point of view of local capability and labour availability, but it is possible that they might not hold in practice to some extent.

In addition to employment impacts, construction of the ICTS would directly generate $111.1 million in income to contractors, manufacturers, and professional services firms. Using the same assumptions as in the direct employment estimates (i.e., all capital expenditures would be made with Hamilton-Wentworth firms with the following exceptions):

o command and control	$8.0 million
o engineering and testing	$5.3 million
o vehicles	$6.9 million

total local income could exceed $91 million. Based on an assumed average labour cost of $32 000 per person-year and 1 418 person-years of employment, about $45.5 million of this amount would be spent on wages and salaries and other employment benefits. As in the case of employment, however, this should be regarded as a maximum amount available to Hamilton-Wentworth, and could be considerably less if contractors from outside the Region are successful in winning contracts.

Estimates of the indirect and induced impacts of a specific project such as the ICTS are subject to a great deal of uncertainty. Income and employment multipliers calculated form input-output models of the overall provincial or regional economy are not directly applicable, and are used in this analysis only for the purpose of giving some indication of the potential magnitude of total income and employment impacts.

A portion of total indirect employment generated by the ICTS capital expenditures was estimated by Metro Canada Limited on the basis of construction industry manuals and past experience. Combining these estimates with indications of the magnitude of total employment derived by means of the Ontario construction industry multiplier suggests that a reasonable approximation of indirect and induced employment would be 1 000 person-years. Adding this amount to direct employment of 1 418 person-years leads to an estimate of total employment due to capital expenditures of approximately 2 400 person-years.

Maximum potential total direct local income from capital expenditures was estimated to be $91 million.

b) Impacts of Operations Expenditures

The continuing employment and income impacts of ICTS operations expenditures were estimated based on information supplied by Metro Canada Limited.

Direct employment on the ICTS would range from 22-42 persons, depending on whether stations were or were not manned. The fully automated system would have no station fare collectors or train drivers; manned station systems would have fare collectors. Total wages and salaries would range from about $646 000 to $1 129 000 with corresponding overhead of 100% for fully automated and manned stations.

Metro Canada Limited expects that operating employment on the existing Hamilton Street Railway system would not decrease as a result of implementation of the ICTS. At least initially then, the ICTS would increase transit system employment by 22-42 jobs, depending on the ICTS' mode of operations. No allowance has been made for the effects of changes in level of usage of the system and supporting bus operations in the future.

In addition to the direct expenditures on wages and salaries, the ICTS would generate services contracts for housekeeping, solid waste removal, escalator maintenance, fare collection sub-station computer costs and energy costs with a total value of $568 000 per year.

The employment and income multipliers most appropriate to the analysis of operational expenditures suggest that total local income would probably be only marginally larger than direct income, while total employment could be in the range of two times the direct employment of 22-42 persons. It is impossible at this point, however, to predict whether this level of indirect and induced employment would actually be realized in Hamilton-Wentworth.

Total Impact vs Net Impact

If it is assumed that the total capital and operating expenditures are amounts that would not otherwise be spent in Hamilton-Wentworth, then the net income and employment impacts of the ICTS project would equal the total impacts. However, it is probable that some portion of the total expenditures, perhaps the 10 percent local share of capital costs, would be spent in some way in the local economy regardless of the ICTS project. The net impacts on the project would thus equal the total impacts less the impacts of alternative forms of expenditures. It would not necessarily be correct, however, to say that this would reduce the impacts of the ICTS by 10 percent, since the multipliers associated with the alternative expenditures could be smaller or larger than the multipliers for the ICTS expenditure.

Of the funds provided by the Government of Canada and Ontario, part would originate in taxes paid by residents and businesses in the region, however, the elimination of the Hamilton-Wentworth project would not necessarily lower expenditures of these levels of Government - rather it is likely that funding would be diverted to other projects elsewhere in the Province (or in the case of the Federal Government, possibly elsewhere in Canada). No adjustment is thus made for this factor.

5.2.6 - PUBLIC SAFETY

General

In the design and construction of ICTS, it will be necessary to safeguard the general public, as well as operations and maintenance staff from potentially dangerous situations or system elements which may involve risks to human welfare.

Construction Impacts

During construction, a number of potentially hazardous situations could have an adverse effect on public safety. The movement of heavy construction equipment, while merging onto public roads and highways could cause traffic congestion and hazardous movement problems. To minimize this impact, it will be necessary to co-ordinate the design of proper entranceways to public roadways. All heavy construction equipment, when idle, should also be parked in designated cordoned-off areas to deter access by venturesome children.

Other potentially hazardous construction activities would also have to be isolated from public access. Suitable separation could be achieved by providing physical and visual barriers to deter trespassing.

The following precautions would be necessary during the construction and operations phases:

a) Use of physical barriers and visual barriers to isolate the ICTS from adjoining public and private lands;

b) adherence to all local safety regulations;

c) locate all potentially hazardous activities and facilities to make them inaccessible;

d) strict enforcement of limited public access by the use of signs and other physical barriers to deter trespassers;

e) confine all construction, operations and maintenance vehicles to designated parking areas, roads, exits and entrances;

f) restrict overloading of truck traffic;

g) enforce adherence of posted speeds; and

h) obligate contractors to repair any damage to roads caused by haulage of construction materials.

Safety and Security

Vandalism

Vandalism which occurs to public property usually depends on the residents of the community. Where the residents are respectful of property, little vandalism will result.

Steps that can be taken by a public agency to prevent vandalism include maximizing vandal-proof design and repairing acts of vandalism that do occur rapidly so that they do not attract further acts of vandalism. A report has been prepared by the Hamilton-Wentworth Regional Police Department to analyse all aspects of safety and security related to the proposed rapid transit system.

Design

Rapid transit systems can be designed to maximize security. Experienced architects and proven design techniques can be employed to improve safety and security in stations. The use of closed circuit T.V. will ensure that all areas requiring security are under surveillance. Mirrors will also be used in strategic locations to protect patrons in enclosed walkways. It is standard practice in rapid transit design to eliminate all features which might result in safety or security problems.

Emergency Response

Rapid Transit vehicles are equipped with a variety of systems for calling for help should it be required in an emergency.

These systems, which may include such methods as microphones and emergency press strips, would be connected directly to the transit operations centre and from there to the police and fire departments.

Passenger Security

In the event of an operational emergency on the transit system, pre-determined emergency procedures will be brought into action. Fire, police, and ambulance staffs will be trained in advance. Trains will be normally brought into the next station and passengers deboarded there. Procedures will also be developed in conjunction with the Police and Fire Departments to handle emergencies at any point along the guideway or tunnel.

Fire Protection

Materials used in modern transit systems are fire resistant, and vehicles and other equipment are designed with their fire load in mind.

Representatives of the Hamilton Fire Department have assisted the Operations Advisory Committee in investigating the effects on fire protection in Hamilton that might occur as a result of ICTS and to determine the appropriate methods to respond to any ICTS emergencies that might occur.

5.2.7 - EFFECTS ON REGIONAL, CITY AND NEIGHBOURHOOD CHARACTERISTICS

Impact to Services

Construction Impacts(38)

The construction of ICTS will impose temporary and permanent impacts on existing roads, transportation systems, buried and overhead utilities and municipal services. Given the elevated nature of ICTS, the greatest conflicts with buried utilities and services occur at the support column locations. Similar problems might be encountered with shallow tunnel sections confined to existing road allowances. Interference with aerial utilities, such as hydro and telephone services, could be a problem along all elevated sections of the ICTS guideway.

Because the City of Hamilton is fully serviced, all streets considered for the ICTS alignment have sewers, watermains, gasmains, telephone and hydro cables.

Some intersecting streets have overhead trolley bus wires and traffic control devices at major intersections. Thus, it would be impossible to build the proposed ICTS without interfering with one or more utilities and municipal services; however, there is some flexibility in the location of support columns in order to minimize the degree of this impact. Although some utilities, such as small diameter gas mains, watermains, minor overhead and buried telephone and low voltage cables are easy to relocate, others are not, particularly sewers. Temporary or permanent relocation of utilities would have to be undertaken as required on an individual basis.

The major impacts associated the disruption to services and utilities and transportation factors are summarized in Appendices 5 and 6. Appendix 8 summarizes the activity-related impacts associated with the construction of ICTS.

Noise Impacts

Construction Impacts

During the construction phase, the extent of the noise problem will depend on existing (ambient) noise levels, actual noise levels from the noise source(s) and suggested mitigative measures, and proximity of affected receivers. An estimate of sound levels from construction should be prepared during the final design stage and submitted to the appropriate agencies for approval.

Operations Impacts

An assessment of noise and vibration impacts along route "W" was carried out by Wilson Ihrig Inc. This assessment consisted of the following:

i) A review of the Ambient Noise Survey conducted in March and April, 1981 by Marshall Macklin Monaghan Limited and Hatch Associates Limited;

ii) A review of noise and vibration measurements taken by Metro Canada Limited and the Toronto Transit Commission of the ICTS vehicle operating on elvated and at-grade sections of the test track facility in Kingston, Ontario;

iii) A limited scope noise and vibration measurement program along route "W" by Wilson Ihrig Inc.; and

iv) A comparison of measured data from other transit facilities operating in North America.

In general, the findings from the Noise and Vibration Impact Assessment report indicate that, although the noise from the ICTS vehicle will not be unnoticable, there will be no adverse noise impact when compared to the City of Hamilton Noise By-Laws, Ministry of the Environment and Transit Industry environmental standards.

Vibration produced by transit travelling on the elevated guideway will have no adverse impacts anywhere along the system as long as the guideway column footings are at least 5 metres away from building footings. In areas where the guideway columns are closer than 5 metres, further analysis is recommended with final design stage on a site-specific basis. One such area for further analysis is the Canadian Football Hall of Fame, where the guideway column locations may be within the 5 metre distance.

The vibration produced by trains travelling underground will create no adverse impacts when compared with criteria developed from other transit systems and environmental standards. However, during final design detailed further analysis is recommended in the shallow tunnel section along Upper James Street between Brucedale Avenue and Fennell Avenue to ascertain that there will be no adverse vibration impacts once the exact configuration and depth of the tunnel structure are determined.

Although all applicable noise criteria are achieved without the use of any special noise reduction measures, during final design further analysis is recommended of the noise levels produced by the ICTS trains at the second and third storey apartment levels of the apartment units on the corner of Hughson and Young Streets. This is recommended since some of these apartments have balconys which directly face the alignment.

In several areas which now have extensive bus traffic, based on proposed bus re-routing with the implementation of ICTS, there is the potential for significant community noise reduction; for example in the Gore Park, John Street, James Street and Jolley Cut areas the peak hour equivalent noise level (L_{eq}) should be reduced by at least 3 dbA.

5.2.8 - PERCEIVED SOCIAL IMPACTS(39)

A major environmental change, such as occasioned by the construction of a rapid transit system, can be expected to have a variety of consequences for the residents of the area. Some of these consequences could affect a person's material interests through changes in taxation or property values. Others could impinge on a person's lifestyle by changing the environment, by changing the essential nature of the neighbourhood and by introducing major or minor changes in a person's style of life. In the present instance where a proposal to construct an elevated rapid transit system is the issue, it is obviously impossible to study the consequences of establishing such a system except by generalizing from past experience with similar systems elsewhere, or by speculating on what might occur, or by asking those living in the area to speculate on what might occur. The latter study alternative was adopted by asking the respondents to express their concerns about the possible consequences of establishing an elevated rapid transit system along the proposed route. In general, the interviewers were well-received and the overall response rate was 83.75%. In other words, only 16% of the heads of households who were contacted personally by the interviewers failed to grant an interview.

5.2.8.1 - Findings From the Primary Impact Area Study

Respondents in the primary sample had no apparent difficulty in ranking the 20 preselected concerns outlined in Table 5.3. No one refused to attempt the ranking. While there are indications of some spread or differences among the rankings of the individuals (differences to be discussed below) the results clearly indicate that the five uppermost concerns (see Table 5.3)* are that:

1. property values will decrease,
2. taxes will increase,
3. that the system will result in more noise,
4. that vandalism and crime will increase,
5. and that people's lives will be disrupted during the construction period.

The higher importance given to these concerns, as indicated by average rank, is supported by evidence given by respondents when asked if any of their concerns, preselected or other, would make them wish to move out of the primary impact area. Apart from 11 respondents (16% of the PIA) who indicated that they would move if the proposed ICTS is built, the main concerns which make a move desirable are:

- that noise will increase (13%),
- that the elevated guideway would look unpleasant (12%),
- that property values would decrease (8%),
- that vandalism and crime would increase (8%), and
- that taxes would increase (6%).

Twenty-five percent of the Primary Impact Area repondents reported no concerns sufficiently strong to make them move from the area.

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* In terms of both the median rank and the percent ranking the concern in the first five ranks.

Conversely, the five least important concerns, in terms of propositions assigned to the last five ranks, are: (6 are listed because of ties)

- that flooding may occur in the tunnel,
- that weather could create dangerous conditions,
- that the elvated guideway might create conditions unsafe for walkers,
- that T.V. reception would be adversely affected,
- that the guideway might make a social division of the neighbourhood, and
- that valued Hamilton landmarks, such as Whitehern, would be adversely affected.(1)

If these concerns are grouped, it appears that concerns relating to material interest (e.g. decrease in property values) and inconveniencing conditions (e.g. disruption during construction) are more important than concerns about the impact of the system on the environment and those relating to privacy and those relating to feelings of insecurity and fear.

A population asked to rank a set of concerns may be in agreement or disagreement about the order of importance of concerns. What one person may see as a very pressing concern, may be relatively unimportant to another. A cursory glance at Table 5.3 reveals that primary impact respondents were not completely agreed on the relative importance of the twenty concerns. This is supported by statistical analysis.(2) However, there is reasonable agreement on concerns about property values and about taxation where, respectively, 72% and 64% of the respondents identified these as one of the five most important concerns. Similarly, only 3% of the respondents regarded adverse effects on Hamilton landmarks as a major concern, and only 6 to 10% saw splitting of the neighbourhood, unsafe walking conditions, poorer

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1) If the ranking of concerns is based on the rank which divides the rankers into those ranking higher than average and those ranking lower than average, then weather conditions and walking conditions would fall outside of this least important group.

T.V. reception, the possibility of tunnel flooding and increased danger under certain weather conditions as major concerns arising out of the establishment of the elevated ICTS. There are signs of less agreement about the high rankings of increased noise and increased vandalism where respondents were almost divided in identifying these concerns as the five most important or as somewhat less important.

TABLE 5.3

Ranking of Concerns of the Primary Impact Area

Median Rank and Proportion Assigning Concern to Ranks 1 to 5

	Median Rank	Rank	Rank % 1 - 5	Rank
Cost of Trips Might Get High	9.42	8	24	9
Disruption During Construction	8.63	5	36	5
Property Taxes Might Go Up	3.19	2	64	2
Might be Difficult to Use	10.75	11	27	8
Area Under Guideway Might Become Dirty	9.33	7	22	10
Major Effect on Environment	9.67	10	21	11
Privacy	14.00	17	18	12
Access for the Handicapped Might be Limited	8.88	6	28	6
Hamilton Landmarks Might be Less Attractive	14.18	18	3	20
Elevated System Might Look Unpleasant	9.63	9	28	6
Noise and Vibrations Might be Bothersome	6.00	3	46	3
No Driver or Attendant	13.63	15	13	14
Neighbourhood Might Split Up	15.00	19	6	19
Decrease in Property Values	2.33	1	72	1
Power Failure Might Leave Train Stranded	12.88	13	16	13
Unsafe for Walking Under Guideway	12.94	14	8	17
T.V. Reception Might Get Worse	15.00	19	8	17
Tunnel Might Flood or Collapse	13.80	16	9	15
Vandalism or Crime Might Increase	6.00	3	46	4
Weather Conditions Might be Dangerous	11.88	12	9	15

Some of this disagreement relates to specific groupings of our respondents. If, for example, respondents are grouped as home owners and as renters, some differences in the average rank given to the 20 concerns are apparent. Thus, while both groups regard a decrease in property values as a high-ranking concern, as shown by the median rank (Table 5.4), twice the proportion of homeowners (88%), as compared to renters (44%) ranked this concern among the five most important. Inspection of Table 5.4 reveals other large differences in identifying the five most important concerns.

Indeed, the five most important concerns identified by each group reveal interesting differences and similarities (Table 5.5). Some differences are understandable, e.g., owners are more likely to be concerned about property values than are renters. Homeowners may have more to fear from vandalism than do renters. Others are less easy to explain, such as renters' greater concern over disruption during the construction phase. The main interest, however, in separating the two groups is to show that there are important differences, as well as similarities, in the order of concerns of the two groups. Thus, while both owners and renters show lower concerns about any adverse effects on Hamilton landmarks, or on the environment generally, or on the safety of walkers, there are also the clear differences shown in Table 5.5.

Where there are differences in concerns, there will be differences required in any attempt to alleviate such concerns. Similar patterns of differential ordering are observed when the sample is divided into those favouring and those opposed to the proposed ICTS.(3) For example, those favouring and those opposing both identify (on the basis of median rank) a decrease in property values, increased taxes and increased vandalism among the five greatest concerns but the rank orders differ slightly. Those who are opposed to ICTS identify

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(2) Analysis shows that while there are differences among renters and among owners in their rankings of concerns, ranking was more homogeneous among renters.

(3) It should be noted that the number in the sub-group of PIA respondents favouring ICTS was small.

TABLE 5.4

Ranking of Concerns Comparing Owners and Renters in the P.I.A.

Owners and Renters: Comparative Ranking of 20 Concerns

	OWN		RENT		OWN		RENT	
	Median	Rank	Median	Rank	% Ranks 1 - 5	Rank	% Ranks 1 - 5	Rank
Cost of Trips Might Get High	11.83	11	5.57	3	2.9	18	47.8	3
Disruption During Construction	10.50	10	4.33	2	26.5	7	56.5	1
Property Taxes Might Go Up	2.41	2	4.00	1	70.6	2	56.5	1
Might be Difficult to Use	10.00	8	14.25	18	29.4	6	17.4	10
Area Under Guideway Might Become Dirty	7.50	6	11.25	10	23.5	9	17.4	10
Major Effect on Environment	10.00	8	9.25	8	11.8	12	21.7	8
Privacy	13.00	14	16.00	20	17.6	10	17.4	10
Access for the Handicapped Might be Limited	9.50	7	6.88	6	26.5	7	39.1	5
Hamilton Landmarks Might be Less Attractive	14.13	16	13.40	17	0.0	20	8.7	18
Elevated System Might Look Unpleasant	6.90	5	13.25	15	44.1	5	0.0	20
Noise and Vibrations Might be Bothersome	5.75	4	7.33	7	47.1	4	39.1	5
No Driver or Attendant	12.50	12	13.33	16	14.7	11	17.4	10
Neighbourhood Might Split Up	15.50	19	11.67	12	2.9	18	13.0	14
Decrease in Property Values	1.63	1	6.25	4	88.2	1	43.5	4
Power Failure Might Leave Train Stranded	13.50	15	11.75	13	11.8	13	21.7	8
Unsafe for Walking Under Guideway	12.50	12	12.75	14	11.8	13	4.3	19

TABLE 5.4
(Continued)

Ranking of Concerns Comparing Owners and Renters in the P.I.A.

Owners and Renters: Comparative Ranking of 20 Concerns

	OWN		RENT		OWN		RENT	
					% Ranks		% Ranks	
	Median	Rank	Median	Rank	1 - 5	Rank	1 - 5	Rank
T.V. Reception Might Get Worse	15.17	18	15.00	19	5.9	16	13.0	15
Tunnel Might Flood or Collapse	15.50	19	10.67	9	8.8	15	13.0	16
Vandalism or Crime Might Increase	5.50	3	6.67	5	50.0	3	39.1	5
Weather Conditions Might be Dangerous	14.17	17	11.33	11	5.9	16	13.0	17
Base	(34)		(23)		(34)		(23)	
	Rho = .54				Rho = .53			

* Rho, as used here, measures the degree to which the two groups rank the concerns in the same order. When rho is equal to one, then they ranked them the same way.

TABLE 5.5

The Five Most Important Concerns of The Primary Impact Area

The Five Important Ranking Concerns

	MEDIAN RANK			RANKED 1-5	
	OWNERS		RENTERS	OWNERS	RENTERS
1.	Decreased Property Values	1.	Increased Taxes	Decreased Property Values	Disruption
2.	Increased Taxes	2.	Disruption	Increased Taxes	Increased Taxes
3.	Increased Vandalism	3.	Cost of Trip	Increased Vandalism	Cost of Trip
4.	Increased Noise	4.	Decreased Property Values		Increased Noise
5.	Elevated System will look Unpleasant	5.	Increased Vandalism	Elevated System will look Unpleasant	Difficulties of Access for Handicapped.

TABLE 5.6

Income Groups: Comparative Ranking of 20 Concerns of the Primary Impact Group

Concern	LESS THAN $20 000		$20 000 OR MORE		LESS THAN $20 000		$20 000 OR MORE	
	Median	Rank	Median	Rank	% Ranks 1 - 5	Rank	% Ranks 1 - 5	Rank
Cost of Trips Might Get High	9.25	8	10.00	8	28.6	7	24.0	8
Disruption During Construction	8.13	5	10.00	8	37.1	5	32.0	5
Property Taxes Might Go Up	3.63	2	3.13	2	65.7	2	60.0	2
Might be Difficult to Use	9.25	8	12.00	13	34.3	6	20.0	10
Area Under Guideway Might Become Dirty	10.25	11	8.00	5	20.0	10	32.0	5
Major Effect on Environment	9.00	6	10.00	8	14.3	13	20.0	10
Privacy	13.25	16	14.00	14	17.1	11	20.0	10
Access for the Handicapped Might be Limited	9.67	10	9.75	7	22.9	9	24.0	8
Hamilton Landmarks Might be Less Attractive	13.29	17	17.00	20	5.7	18	0.0	20
Elevated System Might Look Unpleasant	9.00	6	10.25	11	28.6	7	32.0	5
Noise and Vibrations Might be Bothersome	6.00	3	6.13	4	48.6	3	40.0	4
No Driver or Attendant	12.33	14	15.00	17	17.1	11	12.0	14
Neighbourhood Might Split Up	13.40	18	15.92	19	5.7	18	4.0	17
Decrease in Property Values	2.88	1	2.06	1	68.6	1	76.0	1
Power Failure Might Leave Train Stranded	14.33	19	9.00	6	11.4	14	20.0	10
Unsafe for Walking Under Guideway	12.88	15	14.88	16	5.7	18	4.0	17

TABLE 5.6

(Continued)

Income Groups: Comparative Ranking of 20 Concerns of the Primary Impact Group

	LESS THAN $20 000		$20 000 OR MORE		LESS THAN $20 000		$20 000 OR MORE	
Concern	Median	Rank	Median	Rank	% Ranks 1 - 5	Rank	% Ranks 1 - 5	Rank
T.V. Reception Might Get Worse	14.88	20	14.75	15	11.44	14	4.0	17
Tunnel Might Flood or Collapse	11.40	13	15.63	18	8.6	16	8.0	16
Vandalism or Crime Might Increase	6.67	4	4.33	3	40.0	4	56.0	3
Weather Conditions Might be Dangerous	11.38	12	11.75	12	8.6	16	12.0	14
Base	(35)		(25)		(35)		(25)	
	Rho = .73				Rho = .92			

* Rho, as used here, measures the degree to which the two groups rank the concerns in the same order. When rho is equal to one, then they ranked them the same way.

TABLE 5.7

Education Levels: Comparative Ranking of 20 Concerns of the Primary Impact Group

Concern	LESS THAN HIGH SCHOOL		HIGH SCHOOL OR MORE		LESS THAN HIGH SCHOOL		HIGH SCHOOL OR MORE	
	Median	Rank	Median	Rank	% Ranks 1 - 5	Rank	% Ranks 1 - 5	Rank
Cost of Trips Might Get High	9.00	6	9.83	9	21.4	9	26.3	9
Disruption During Construction	12.00	12	7.50	5	25.0	6	42.1	4
Property Taxes Might Go Up	3.50	2	3.17	2	67.9	2	60.5	2
Might be Difficult to Use	11.00	10	9.50	8	25.0	6	28.9	7
Area Under Guideway Might Become Dirty	7.50	5	10.17	11	21.4	9	23.7	10
Major Effect on Environment	10.00	9	9.38	7	21.4	9	13.2	15
Privacy	13.83	7	14.00	17	21.4	9	15.8	13
Access for the Handicapped Might be Limited	9.83	8	8.00	6	25.0	6	31.6	6
Hamilton Landmarks Might be Less Attractive	13.81	17	14.36	18	3.6	19	2.6	20
Elevated System Might Look Unpleasant	9.50	7	10.00	10	28.6	5	28.9	7
Noise and Vibrations Might be Bothersome	5.50	3	6.25	4	50.0	3	42.1	4
No Driver or Attendant	13.50	15	13.50	15	7.1	17	18.4	12
Neighbourhood Might Split Up	15.83	20	13.50	15	3.6	19	5.3	18
Decrease in Property Values	2.21	1	2.50	1	71.4	1	71.1	1
Power Failure Might Leave Train Stranded	13.50	5	12.50	12	17.9	13	15.8	13
Unsafe for Walking Under Guideway	12.25	13	13.21	14	10.7	14	21.1	11

TABLE 5.7

(Continued)

Education Levels: Comparative Ranking of 20 Concerns of the Primary Impact Group

Concern	LESS THAN HIGH SCHOOL		HIGH SCHOOL OR MORE		LESS THAN HIGH SCHOOL		HIGH SCHOOL OR MORE	
	Median	Rank	Median	Rank	% Ranks 1 - 5	Rank	% Ranks 1 - 5	Rank
T.V. Reception Might Get Worse	14.50	19	15.50	20	10.7	15	5.3	18
Tunnel Might Flood or Collapse	12.50	14	14.50	19	7.1	17	10.5	16
Vandalism or Crime Might Increase	5.50	3	6.17	3	50.0	3	44.7	3
Weather Conditions Might be Dangerous	11.50	11	12.50	12	10.7	16	7.9	17
Base	(28)		(38)		(28)		(38)	
	Rho = .87				Rho = .92			

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* Rho, as used here, measures the degree to which the two groups rank the concerns in the same order. When rho is equal to one, then they ranked them the same way.

TABLE 5.8

Predisposition on ICTS: Comparative Ranking of 20 Concerns of the Primary Impact Group

Concern	FAVOUR		OPPOSE		FAVOUR		OPPOSE	
	Median	Rank	Median	Rank	% Ranks 1 - 5	Rank	% Ranks 1 - 5	Rank
Cost of Trips Might Get High	4.00	1	10.50	11	75.0	1	13.5	12
Disruption During Construction	6.00	5	10.00	10	41.7	5	34.6	5
Property Taxes Might Go Up	4.50	2	3.17	2	58.3	2	63.5	2
Might be Difficult to Use	15.00	19	9.00	7	8.3	14	32.7	6
Area Under Guideway Might Become Dirty	10.00	9	9.17	8	33.3	6	17.3	9
Major Effect on Environment	10.83	10	9.38	9	16.7	9	15.4	11
Privacy	15.50	20	13.70	15	16.7	9	17.3	9
Access for the Handicapped Might be Limited	9.00	8	8.50	6	33.3	6	26.9	8
Hamilton Landmarks Might be Less Attractive	13.50	15	14.38	18	0.0	20	3.8	20
Elevated System Might Look Unpleasant	11.50	11	7.83	5	8.3	14	32.7	6
Noise and Vibrations Might be Bothersome	8.50	6	4.50	3	16.7	9	53.8	3
No Driver or Attendant	13.50	15	13.75	16	8.3	14	13.5	13
Neighbourhood Might Split Up	12.50	13	15.17	20	8.3	14	5.8	18
Decrease in Property Values	4.50	2	2.17	1	58.3	2	75.0	1
Power Failure Might Leave Train Stranded	8.50	6	13.50	14	33.3	6	13.5	14
Unsafe for Walking Under Guideway	12.50	13	13.00	13	0.0	18	9.6	15

TABLE 5.8

(Continued)

Predisposition on ICTS: Comparative Ranking of 20 Concerns of the Primary Impact Group

Concern	FAVOUR		OPPOSE		FAVOUR		OPPOSE	
	Median	Rank	Median	Rank	% Ranks 1 - 5	Rank	% Ranks 1 - 5	Rank
T.V. Reception Might Get Worse	14.50	18	15.10	19	16.7	9	5.8	18
Tunnel Might Flood or Collapse	11.50	11	13.75	16	16.7	9	7.7	17
Vandalism or Crime Might Increase	5.50	4	6.00	4	50.0	4	48.1	4
Weather Conditions Might be Dangerous	13.50	15	11.75	12	0.0	18	9.6	15
Base	(12)		(52)		(12)		(52)	
	Rho = .62				Rho = .59			

* Rho, as used here, measures the degree to which the two groups rank the concerns in the same order. When rho is equal to one, then they ranked them the same way.

decreased property value and increased taxes as first and second ranking concerns, whereas those who favour ICTS identify increases in the cost of trips as the first ranking concern, with decreased property value and increased taxes tied for second rank. Moreover, the median ranks for the property values and property taxes concerns are higher for those who are unfavourable to ICTS. While the correlations of rankings by renter and owner, and those favouring or opposed to ICTS, indicate differences in the rankings of concerns made by these sub-groups, correlations indicate considerably smaller differences in rankings by sub-groups divided in terms of income or education. (See Tables 5.6, 5.7 and 5.8.)

5.2.8.2 - Findings From The Secondary Impact Area Study

The results were strikingly different for respondents in the Secondary Impact Area sample. Instead of being given a list of concerns, these respondents were asked to identify their concerns "about the proposed Rapid Transit System". Up to three of their most important concerns were recorded and analyzed.

Thus, given the opportunity to express their own concerns, it was found that:

1. slightly more than 40% of those responding expressed no concerns at all;

2. about 61% did not express a second concern; and

3. 79% did not express a third concern.

Given that these respondents had been forewarned of the interview and that about half of them had received fact sheets, the apparent lack of concern about the ICTS proposal is surprising. Indeed, only 18 persons out of those responding in the SIA could voice a first concern, 17 different concerns were identified, 16 for those expressing a second concern. However, these concerns were spread out among the SIA respondents with very little "clustering" of concerns. Thus, among those responding, 11 (12%) identified a concern that taxes would increase, 6 (7%) expressed concern about increased noise, and another 6 expressed concern over the chosen route. The only other concern to be identifed by as many as 5 respondents was that the cost of an ICTS trip would become high. For those identifying a second concern, only two concerns were identified by more than 5 persons. Ten respondents expressed concern about a tax increase (11%) and 7 respondents expressed concern that noise levels might increase (8%). For third concerns, no concern was identified by as many as five persons, although 4 people expressed concern that noise levels might increase.

i) Concerns and Home Ownership

As in the case of the primary impact respondents, secondary impact respondents who rent housing responded differently than those who own their own homes. Homeowners, generally, identified more concerns, and tended to differ from renters, in the narrower focusing of their concerns. Thus, the number of renters failing to identify a first concern was four times that of owners. Twice as many renters as owners failed to identify a second concern and almost 1½ times as many renters as owners failed to identify a third concern. The responses of those identifying concerns were spread over a dozen or so concerns so that there was little clustering of responses. Even so, differences between owners and renters could be observed. For example, of the 10 respondents expressing concern that taxes might increase, 6 were owners and 4 were renters. Five owners to 1 renter expressed concern about the chosen route, whereas 4 renters to 2 owners were apprehensive about increased noise level. While these numbers are small, the pattern over the set of concerns does support the conclusion that, as in the primary impact group, renters and owners differ in their concerns about the proposed Rapid Transit System.

ii) Concerns and ICTS Predisposition in the SIA

A pattern similar to the above can be observed for those who favour and those who oppose the proposed ICTS. Thus, only 5 of the 46 persons expressing opposition failed to identify an important concern compared to 22 of the 39 persons saying they favoured the proposed system.

5.2.8.3 - Summary of Concerns for the PIA and SIA

It may be concluded for those living in the areas nearest to the proposed route, that there are some serious concerns. Although this conclusion is more apparent for the PIA respondents, it also holds for SIA respondents, whose replies to the interviewers covered a broad range of concerns, even though these did not concentrate clearly. Concerns for falling property values, for increases in taxes to pay for the system, for increasing noise levels, for increasing crime and vandalism, and for a period of disruption during the construction phase appeared to be genuinely felt among the SIA respondents.

While it is possible that a rapid transit system, capable of expansion, can benefit many people living in the Hamilton-Wentworth area, it seems likely that some disadvantages of the system may fall disproportionately on those living along the proposed route. Moreover, as indicated by our analysis of these persons' concerns, the disadvantages may be differentially distributed depending on whether a person is a home owner or renter. Certainly, it has been shown, that respondents varied in their concerns for the consequences of the system. Thus, any action to reduce these disadvantages must take into account the different lifestyles and interactions of people living in the route area.

5.2.8.4 - Mitigative Measures

If the views of the persons concerned about the potential impact of the proposed ICTS are taken into account, one-third of the PIA respondents have a clear but simple recommendation: do not build the System.

All residents in the PIA who ranked property values as one of their three most important concerns were asked which of the following would mostreduce their concern:

1. Rezoning your area from residential to commercial.

2. Being guaranteed a fair market selling price for residents who want to move.

3. Reducing property taxes.

4. Receiving a subsidy to cover relocation to equivalent housing if there are price differences.

Of the 46 residents who ranked property values as one of the top three concerns:

1. 5 (11%) replied that none of these measures would satisfy their concern;

2. 5 (11%) replied 'reducing taxes';

3. 9 (20%) opted for the 'subsidy';

4. 12 (26%) chose 'rezoning';

5. 14 (30%) selected the guaranteed fair market selling price concept; and

6. 1 respondent replied 'don't know'.

Thus, the only conclusion to be drawn is that there is no consensus among those PIA residents who were concerned deeply about the property values as to what is the best way to satisfy the concern. Indeed, concern about property values ranked extremely high with 46 (69%) of the residents ranking this concern in the top three and 72% ranking this item in the top five.

About the same proportion (25%) of SIA and PIA respondents could not suggest remedies for their concerns. Another 19% recommended that the system not be built. Again, the remainder offered a variety of suggestions, although there was not much clustering of suggestions. For example, 9% suggested that another route be chosen and 3% suggested that the system be built underground.

Although the respondents, whether resident in the primary or secondary impact area, were less prolific than might be expected in offering solutions to their concerns, this should not lead to the conclusion that their concerns are trivial and that remedies can be ignored. There is a real concern that property values will decrease and that taxes will increase.

For the property value concern, some form of insurance to protect the property owner is required. Although it may seem reasonable to suggest that anyone who buys property must accept the risks of market forces, the building of an elevated Rapid Transit System appears to present an extraordinary risk and therefore property owners should be protected against loss.

The noise is a concern of a different nature. If excessive, noise can interfere with the personal and social lives of the residents and can affect health. If the engineering analysis is correct in its assessment of low noise levels for the proposed ICTS, there can be no problem. The respondents tended to agree that noise from traffic is currently a problem. To properly isolate the actual disbenefit of any ICTS-related noise, measurements of the traffic noise levels should be made before and after possible construction.

The disruption during construction concern is of a temporary nature but may require some remedial action where residents' homes are affected.

Finally, vandalism, an apparent present concern in the area, can only be combatted by a combination of public education and sensitive policing.

6.0

PUBLIC RESPONSE TO THE PROPOSED ALIGNMENT

6. PUBLIC RESPONSE TO THE PROPOSED ALIGNMENT

6.1 Purpose of the Public Participation Program

The public participation program involved the following phases:

a) introduction of the project to the public;

b) identification of specific alignment impact areas and solicitation of public response on evaluative factors;

c) introduction of alignment alternatives and solicitation of public response on these alignments; and

d) organizing a Community Advisory Committee on Rapid Transit (CACRT) to provide a focus on community concerns throughout the study.

Major activities of the public participation program included: open houses, presentations to social, business and community groups, interested institutions and schools, public notices in local newspapers and on radio stations, and flyers distributed to residents and businesses in the study corridor and adjacent areas, schools and libraries.

6.2 Chronological Summary of Public Participation

October 1980

The first phase of the public participation program began in October 1980.

Advertisements for the first Open House were published October 22, in all the papers throughout the Region. The ads included a clip-out response questionnaire.

A hand-out brochure carrying the same information as the advertisement was printed for the Open House. Technical brochures were also available as were a variety of displays and an audio visual program.

Two news releases were issued during October. The first one, released October 21, provided the media with information on the upcoming Open House and some background information on the project. The second, recapped the Open House, and was released the day after the event.

The project office hosted the first Open House on October 30, 1980 between 2:00 p.m. and 10:00 p.m. A total of 115 people attended and of those, 40 (35%) took the time to provide written comments. The majority of comments (67.5%) were very supportive, although 27.5% were undecided. Only two were opposed (5%).

The media provided coverage of this first public event. CBC-TV did a minute spot on the project that was aired on Toronto and Kingston stations on October 23. CHCH-TV aired a summary of the program on October 30. "The Specator" had a small article before the Open House and followed with a summary the next day. CKOC interviewed the public during the Open House. Radio stations CHML, CKDS, CJJD, and CKOC carried a public announcement October 29, 1980.

The public participation process was outlined for the Ontario Ministry of the Environment staff at a meeting held on October 15, 1980. Their general concurrence was received at this meeting.

The Canadian Society of Civil Engineers invited UTDC to provide guest speakers for their conference on October 3, 1980, at the Royal Connaught Hotel. Dr. A. Ross Gray spoke on the ICTS Program and Mr. James Chatfield spoke on the ICTS technology. At the associated luncheon, Regional Chairman Anne Jones spoke on the potential future implementation of the ICTS technology in the Hamilton-Wentworth Region.

November 1980

The Rapid Transit Project Office was open to enquiries by members of the public interested in the rapid transit project.

Public Presentation and Activities

Date	Description	Number in Attendance
November 11	Presentation to the Kiwanis Club of Hamilton Central	28
November 13	Sheridan College interview with journalism student	2
November 19	CHCH interview for special segment on Transportation for the Cherington Show	1
November 28	Presentation to Cathedral Boys High School	20
Month of November	Visitors to Project Office	64
	Coupons and postcard reply	30
	Sub-Total	145

December 1980

The holiday season somewhat tempered the public interest vis-a-vis the Rapid Transit Project. Only one presentation was given during December and fewer people came to the office than in previous months.

Interestingly enough, media coverage increased during December. CHCH-TV aired a special 30 minute presentation on December 11.

Two news releases were also prepared. The first one dealt with the upcoming Open House "Rapid Transit Alignment Unveiled" and the second related to special soil surveys to be undertaken before spring thaw, "Rock Investigation on the Escarpment".

Public Participation and Activities

Date	Description	Number in Attendance
December 1	Meeting with Durand Neighbourhood Association	6
December 3	Burlington Post telephone interview	1
December 4	CHCH-TV crew visited UTDC Test and Development Centre in Kingston	1
December 8	CHCH interview	1
December 11	Regional Chairman Anne Jones and Ross Gray, Deputy Project Manager were interviewed on the air for the Cherington Show.	1
December 19	Interview with "Spectator" reporter in regard to Travel Survey	1
December 22	"Spectator" interview	1
Month of December	Visitors to Project Office	21
	Coupons and postcard reply	15
	Sub-Total	49

January 1981

In January 1981, the public was asked for their reaction to the rapid transit project and the 13 possible route alignments. They were also asked for their reaction to the factors used in evaluating the different alignment alternatives. Response in these areas was obtained from a coupon which was part of a display advertisement published in the Hamilton Spectator on January 21, 1981; from an exit form of the same format as the coupon, computed by citizens visiting open houses on January 26, 27 and 28, 1981; and from comments arising from face-to-face discussions with Metro Canada Limited staff at the open houses.

The Region was divided into a number of study areas to reflect the geographic distribution of the responses, because they would differ depending on the proximity of the study area to the alignment.

The public response was analysed according to the following factors:

i) how each of the study areas rated the evaluation factors;
ii) taking one factor at a time, how all areas rated each factor;
iii) how all citizens who responded rated the factors;
iv) level of support shown for the rapid transit project in each area;
v) level of support indicated by all citizens who responded; and
vi) a content analysis of comments from coupons, exit forms, letters and staff record forms, to analyse general response.

Citizens were asked to review a set of nine evaluative factors which were established to assess alignment alternatives; to decide how important each factor was in choosing a final alignment; and to indicate a level of importance (high, medium or low) for each factor. These evaluative factors are listed below with an explanation for each as they appeared both in the newspaper coupon and on exit form at the open house.

Quality of Service: make it as accessible as possible, eg. convenience of transfer to and from bus system, convenient pedestrian access and reduced travel time.

Traffic Movement: maintain the capacity of the road system, eg. minimize removal of lanes both during construction and when the system is completed.

Flexibility: ease with which the system can be built in stages.

Natural Environment: have the least effect on the soil stability and vegetation of the area, especially on the Escarpment.

Appearance and Views: preserve the existing views, to and from and on the Escarpment.

Visual Integration: ensure that the system is designed to complement the existing streetscape.

Property: have the least loss of land along the alignment and at station locations.

Regional Government: assist the Region in achieving its future land use plans.

Cost: minimize the cost for the rapid transit construction and minimize the cost of operation of the total transit system.

The rank of importance of each evaluation factor is illustrated in Table 6.1. Quality of Service, Natural Environment and Traffic Movement were ranked as the most important factors to be considered in selecting a final alignment.

Table 6.1

Rank of Importance of Each Evaluation Factor

Rank	Factor
1	Quality of Service
2	Natural Environment
3	Traffic Movement
4	Appearance and Views
5	Cost
6	Visual Integration
7	Property
8	Flexibility
9	Regional Growth

The results of the coupons and exit forms indicated that cost was less important than four other factors in selecting a final alignment. Flexibility and Regional Growth were ranked as the two least important factors. Concern over property loss was higher among residents who lived near a possible alignment. Citizens were most concerned that the ICTS provide a high quality of service that is convenient to transfer to and from the bus system, convenient for pedestrian access, and reduces travel time. Of secondary concern was the public's concern about the Escarpment, soil stability, parks and treed areas. Respondents were also concerned that the capacity of the road system be maintained to ensure continuous traffic movement both during construction and operations stages.

During this open house, most respondents (69%) were supportive of a rapid transit system for the Region, and believed it could provide an efficient addition to the present transit system if it was integrated to provide a comprehensive service.(37)

Public Participation and Activities

Date	Description	Number in Attendance
January 14	Presentation to Corrosion Engineers of Ontario at the Ontario Research Centre	28
January 16	"Spectator" Interview	1
January 20	Presentation to the Kiwanis Club of Hamilton	20
January 21	News Releases to all the media across the Region: CBC Radio, CBC-TV, Spectator, CJJD, CHCH, CKOC, CHML, CKDS, Brabant Newpapers, and Channel 4.	11
January 21	Interview with "Spectator" reporters	4
January 21	Interview with Brabant newspapers	1
January 21	Meeting with Program Director for Channel 4 to discuss the possibility of a special Talk Show on Rapid Transit.	1
January 22	First Community Advisory Committee on Rapid Transit meeting.	8
January 23	Media briefing to announce the Open Houses and provide the media with an update on the project. Present were: CHCH, CHML, CJJD, CKOC.	5
January 26	Open House at Crestwood Vocational School.	113
January 27	Open House at the New Public Library.	288
January 28	Open House at the Hamilton-Wentworth Project Office. CKOC TV of Kitchener covered the Open House.	97
January 29	Second meeting of the Community Advisory Committee on Rapid Transit to review the results of the Open House.	11
January 30	CHML interview was broadcast on their six o'clock news.	1

February 1981

Date	Description	Number in Attendance
February 3	Presentation to the Chamber of Commerce.	13
February 4	Presentation of the Generation of the Alignments to the Hamilton Mountain Rotary.	60
February 9	Two consecutive presentations to students at Delta Secondary School.	800
February 9	Durand Neighbourhood Association meeting at Project Office to discuss Alignment Generation.	4
February 12	Provide "Spectator" with maps of the selected alignments after discussion at Steering Committee.	1
February 18	Meeting with students from Winston Churchill Secondary School.	9
February 18	Community Advisory Committee visited Transit Development Centre in Kingston.	31
February 18	Presentation to the Hamilton Mountain United Church.	20
February 19	Met with planning class at Mohawk College.	20
February 24	Met with Board of Directors of the Berrisfield Community Council.	6
February 26	Interview with "Spectator" reporter.	1
February 26	Community Advisory Committee meeting.	14
February 26	Met with Plant Superintendent for St. Joseph's Hospital on Generation of Alignments in vicinity of the hospital.	1
February 27	Regional Councillors visited the Transit Development Centre in Kingston.	8

March 1981

In March 1981, the study team conducted another Open House to solicit public preferences for alignments W, X, Y, and Z. Of the various alignments considered, alignment W, the preferred route, was the most preferred (32%).

Date	Description	Number in Attendance
March 2	Cable 4 to discuss possibilty of a few T.V. programs to increase awareness among Hamilton population.	1
March 4	Presentation to the Talus Group at the Project Office on how alignments were generated and how four alignments were selected.	38
March 4	Interview with "Spectator" to explain how the four alignments were selected.	1
March 4	Interview with CHCH to provide new developments in the Rapid Transit study and dates for the Open Houses.	2
March 4	Met with CHML to ensure radio coverage for Open Houses.	1
March 4	News releases to CKOC, CJJD, CBC Radio and CBC-TV.	4
March 4	Interview with Brabant Newspapers to discuss new development in the project and the forthcoming Open Houses.	1
March 4	Interview with Cable 4 to discuss results of the past Open Houses, reactions and concerns of the public, agreed to prepare two T.V. shows during the course of the month.	1
March 6	Mountain Cable program director contacted to schedule a special feature on Rapid Transit.	1
March 9	Open House at the Transfiguration Lutheran Church.	239
March 9	Live interview with CHML.	1

March 1981 (Continued)

Date	Description	Number in Attendance
March 9	Cable 4 visited the Open House - footage taken for further T.V. specials.	2
March 10	Open House at the new Hamilton Public Library.	358
March 10	CKCO-TV did a newscast on the Open House.	2
March 11	Open House at St. Michael's Separate School.	193
March 12	Interview for the Mid-Day show on CHCH-TV (March 13).	1
March 16	Meeting held by the Durand Neighbourhood Association.	110
March 17	Interview on Cable 4. A presentation of the Rapid Transit Project was made, followed by an open line after the Council Meeting.	1
March 18	Community Advisory Committe on Rapid Transit met.	16
March 25	Mountain Cable presented a one-hour special program on Rapid Transit.	1
March 26	Presentation to St. Joseph's Hospital Building and Property Management Committee.	25

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April 1981

Date	Description	Number in Attendance
April 8	Presentation to the Stoney Creek Citizens' Association.	7
April 9	C.A.C.R.T. Meeting	21
April 10	Presentation to the Administration Committee of Mohawk College of Applied Arts and Technology.	16
April 15	Presentation to the planning and geography class of Parkside High School, Dundas.	
April 17	Interview by Brabant Newspapers, and Hamilton "Spectator".	2
April 21	Interview by Hamilton Mountain News.	1
April 21	Interview by CHML.	1
April 22	Presentation to Hill Park Secondary School to geography and planning students.	32
April 22	Interview with CHCH-TV. The story dealt with project schedule, and possible construction dates.	1
April 30	Interview with Hamilton "Spectator", about the overall progress of the pre-implementation program.	1

May 1981

In May 1981, Open Houses were conducted to provide interim information on the four routes. Scale models of the system in Mountain and Downtown settings were presented. The public indicated that they required more information on the need for a rapid transit system, and on the cost and effect of such a system on properties.

Date	Description	Number in Attendance
May 7	C.A.C.R.T. Meeting.	18
May 11	Met with Mr. Black and Sister Joan of St. Joseph's Hospital to discuss the implication of route W on the hospital property.	2
May 21	C.A.C.R.T. Meeting.	17
May 26	Open House at the Ukrainian Catholic Church of the Resurrection.	195
May 27	Meeting with group of downtown businessmen.	8
May 27	C.A.C.R.T. members were taken on a tour of the four selected alignments.	15
May 27	Open House at First Place.	150
May 28	Open House at the Immanuel Christian Reformed Church.	320
May 29	Open House at the New Hamilton Public Library.	324

June 1981

In June 1981, Open Houses were conducted to provide the final information package on the four routes. Detailed comparison display panels were shown and staff were available to answer questions and supply additional information. As well a major report, "Rapid Transit Study, Route Choices: Summary of Findings" was available to the general public.

Date	Description	Number in Attendance
June 1	Interview for a special program on Rapid Transit on Cable 4.	2
June 3	Community Advisory Committee on Rapid Transit met.	18
June 9	Interview with Hamilton Magazine.	3
June 12	Presentation on the Rapid Transit study to the Masonic Group.	45
June 12	Interview with Brabant Newspapers.	2
June 16	Council briefing for the Summary of Findings report.	
June 17	Met with officials of St. Joseph's Hospital.	7
June 17	A special media briefing was held relevant to the Summary of Findings. Present were CHML/CKDS, CJJD, CKOC, CKCO-TV, Cable 4, Hamilton Magazine, "The Spectator", and Brabant.	10
June 17	The C.A.C.R.T. met.	16
June 22	Open House held at the Ukrainian Catholic Church of the Resurrection.	87
June 23	Open House held at Mohawk College.	235
June 24	Open House held at the Hamilton Convention Centre.	176
June 24	A special meeting was scheduled to offer the opportunity to citizens to present their briefs before council in regards to the Rapid Transit Study. 11 briefs were presented publicly and eight letters were also submitted.	
		672

July 1981

Date	Description	Number in Attendance
July 3	Interview with Hamilton Magazine	2
July 17	CHCH TV, request for more detailed information on route "W", the preferred route.	1
July 17	"Spectator" reporter visits office for information on route "W".	1
July 21	Inquiries from the Daily Commercial News.	1
July 30	Interview with Corriere Canadese	2
July 31	Interview with CHCH-TV.	1

August 1981

Date	Description	Number in Attendance
August 5	Community Advisory Committee meeting - hiring of Public Participation Consultant.	18
August 6	Presentation to the downtown Rotary Club.	100
August 17-22	Hamilton-Wentworth Rapid Transit Project participated in Eaton's Canadian Celebration. Approximately 1 500 shoppers visited the display.	1 500
August 18	On Cable 4, a 20 minute interview.	1
August 21	Community Advisory Committee meeting with the new Public Participation Consultant.	13
August 25 - September 17	Commenced interviews with individual C.A.C.R.T. members to summarize group issues.	total of 17
August 27	Interview with Hamilton Magazine.	1

September 1981

Date	Description	Number in Attendance
September 8	Interview with Hamilton Magazine to discuss the project in further detail.	2
September 9	Community Advisory Committee on Rapid Transit meeting. The press were in attendance.	
September 11	Durand Neighbourhood Association invited the Deputy Project Manager to walk through their neighbourhood in order that the study team fully understand their concerns.	
September 11	Rapid Transit T.V. show with Mrs. Jones, Mrs. Kippen.	
September 15	Mr. Ross Gray was the guest on "View on Regional Council" to discuss the project.	
September 16	Upper James residents meet with Ross Gray to discuss their concerns.	
September 16	Mountain Cable 4 aired a special two-hour T.V. shown on Rapid Transit "Forum on Rapid Transit". Members of the panel were: Moderator, Reverend Don Cornish; Councillors Jim Bethune and Ken Edge; COST representative Mrs. Lorna Kippen; Mrs. Mary Norris; and Deputy Project Manager for Metro Canada, Ross Gray. Approximately 20 citizens called to ask questions.	
September 22	Social Planning and Research Council sponsored forum on Rapid Transit.	
September 23	C.A.C.R.T. to met.	

6.2.1 - PUBLIC RESPONSE TO SELECTED ALIGNMENTS(39)

According to Section 5.2.9, the population that has the potential of being most directly impacted is the Primary Impact Area homeowner group of the study. It is significant that this group has the opinion that it will be severely impacted by the possible implementation of the ICTS. In particular, the homeowners in the PIA are 94% opposed to the ICTS. Compared to the 43% opposed among the PIA renters, 70% are opposed among the homeowners in the Secondary Impact Area, and 25% opposed among the SIA renters. From those findings, it is clear that the PIA homeowners feel disproportionately more threatened by the proposed ICTS.

Although corridor residents in general report a highly positive Quality of Life (QOL), the homeowners in the PIA had QOL scores that were substantially less positive than were those of SIA homeowners. Also, the renters in the PIA had low QOL scores compared to renters in the SIA.

The PIA respondents felt that noise during the daytime, noise during sleeping hours and traffic were problems significantly more so than did SIA residents. The homeowners stated that their neighbours were friendly, that their neighbourhood was not very crowded, that there were a lot of stores to shop in and that it was easy to get downtown by bus. Further, they felt that their neighbourhood was safe and relatively free from crime; they felt that traffic and noise levels were comparative disadvantages of their neighbourhood; and that traffic, noise, and vandalism are the most serious problems in their neighbourhood.

With respect to the proposed ICTS, the most serious concerns of the PIA are the possible decrease in property values, increasing property taxes, noise and vibration, and that crime and vandalism might increase. Possible mitigative measures to address concerns regarding property values were investigated but the Corridor residents did not have a consensus as to how to best alleviate their concerns.

On the concern of property tax increases, all groups in the study, with the exception of the PIA, are predisposed to favour the proposed ICTS if the property tax cost to the average Hamilton taxpayer was $14 per year for 10 years.

Although noise and vibrations are real concerns, the analysis has been discussed in Section 5 of this report. With respect to possible vandalism, a separate statement will be forthcoming from the Hamilton-Wentworth Regional Police Department.

Except for the PIA residents, SIA homeowners, and residents of Wards 3, 4 and 7, other areas of the region are generally in favour of the ICTS. The main reasons are the direct traffic-related benefits of speed and ease of usage. It is interesting to note that groups which admit that they would probably not use the ICTS report that they are in favour...apparently for broader reasons such as economic development of the community, enhancing the image of Hamilton, and moving forward.

Summary of Residents' Predisposition on the Proposed ICTS

Because of their importance, three summary tables are included here. On the next page, an overall summary of predispositions of the ICTS is presented. On the pages which follow, Table 6.2 describes the Predispositions of the various geographic sections of the Region and Table 6.3 describes the Predisposition of Hamilton by City Ward. It is interesting to note that a geographical split on the issue occurs between the 'inner' wards (3, 4, and 7) which tend to be 'opposed' and the 'outer' wards (1, 2, 5, 6, and 8) which tend to be 'in favour'. Thus, there is not a Mountain/Lower City division on the issue, but rather a combined East/West predisposition in contrast with the predisposition of the Central areas.

Throughout the Region there appears to be a wide-spread predisposition to favour the proposed ICTS. Segments where there were statistically significant differences between sub-groups are presented on the following page.

SEGMENTS WHERE A MAJORITY OF RESIDENTS ARE PREDISPOSED TO FAVOUR THE PROPOSED ICTS		SEGMENTS WHERE A MAJORITY OF RESIDENTS ARE PREDISPOSED TO OPPOSE THE PROPOSED ICTS	
Percentages are those who Favour:		Percentages are those who Oppose:	
(76%)	Secondary Impact Area	(81%)	Primary Impact Area
(60%)	Lower City		
(53%)*	Upper City		
(72%)	Ward One (Hamilton)	(52%)	Ward Three (Hamilton)
(64%)	Ward Two (Hamilton)	(56%)	Ward Four (Hamilton)
(70%)	Ward Five (Hamilton)	(51%)*	Ward Seven Hamilton)
(52%)*	Ward Six (Hamilton)		
(59%)*	Ward Eight (Hamilton)		
(70%)*	Suburbs		
(72%)*	Ancaster		
(64%)*	Dundas		
(63%)*	Flamborough		
(71%)*	Glanbrook		
(79%)*	Stoney Creek		
(75%)	Rented Dwelling		
(56%)	Owned Dwelling		
(66%)	Less than age 60	(62%)	Age 60 or over
(83%)	Awareness Index (High-4)	(55%)	Awareness Index (Low-Score 1)
(67%)	Awareness Index (Score-3)		
(53%)	Awareness Index (Score-2)		
(55%)	Easier to Travel with ICTS for No one in Household (average)		

SEGMENTS WHERE A MAJORITY OF RESIDENTS ARE PREDISPOSED TO FAVOUR THE PROPOSED ICTS		SEGMENTS WHERE A MAJORITY OF RESIDENTS ARE PREDISPOSED TO OPPOSE THE PROPOSED ICTS	
Percentages are those who Favour:		Percentages are those who Oppose:	
(80%)	Easier to Travel with ICTS for at least one person in Household (average)		
(54%)	No one would travel via ICTS (averaged seasons)		
(75%)	At least one person in household would travel via ICTS (averaged seasons)		
(81%)	Could Identify Advantages	(78%)	Could not Identify Advantages
(80%)	Could not Identify Disadvantages	(54%)	Could Identify Disadvantages
(65%)	Someone in the household is employed	(54%)	No one in the household was employed
(86%)	Linkage with GO Transit benefits		
(80%)	Identify Shopping Benefits (average)		
	For Mountain Rapid Transit Suggested...		
(83%)	Proposed ICTS	(67%)	Bus
(68%)	Total Subway	(55%)	Car or Taxi
(61%)	Incline/Cable Car		
(59%)	No Suggestions		

* Refers to expanded samples which include supplemental cases. Otherwise, all findings refer to the large representative REGION sample of 612 completed interviews. The Primary Impact Area and Secondary Impact Area percentages are drawn from the PIA Study of 67 interviews and the SIA sample of 100 completed interviews.

If one were to ask for a single Table to summarize the residents' predispositions concerning the proposed ICTS for Hamilton, Table 6.2 provides such a clear and concise summary.

Table 6.2

SUMMARY OF RESIDENTS' PREDISPOSITION ON THE PROPOSED ICTS FOR HAMILTON

(September, 1981)

Q. Taking everything into consideration, are you in favour of, or opposed to, building the Rapid Transit System as presently proposed -- if the property tax effect to the average Hamilton taxpayer was $14 per year for 10 years -- and if there is no extra burden on local property taxpayers for operating costs?

	PIA	SIA*	LOWER CITY	UPPER CITY	TOTAL HAMILTON	SUBURBS	REGION
	%	%	%	%	%	%	%
In Favour	19	76	60	53	59	70	61
Opposed	81	24	40	47	42	30	39
Total	100	100	100	100	100	100	100
(Base)	(64)	(90)	(270)	(200)	(429)	(175)	(558)

* The SIA is an estimate based upon weights applied to the disproportionate sampling as described in Chapter Two of the Social Impact Survey.

From the findings of Table 6.2, it can be seen that a majority of all groups were in favour of the proposed ICTS when only those residents who express a clear 'in favour' or 'opposed' opinion are considered. The exception to this favourable response was among the residents in the Primary Impact Area.

ICTS Predisposition of Residents' by Hamilton City Wards

Within the City of Hamilton, almost 60% of the population was in favour of the proposed ICTS. When examining the TOTAL HAMILTON sample more closely, significant differences by City Ward arose. Generally speaking, there is a majority of support from the West End of the City, both above and below the Mountain, (Wards 1, 2, and 8) as well as the East End of Hamilton (Wards 5 and 6). Ward 2 is of particular interest since the portion of the ICTS to be located in the Lower City is proposed for this ward. Sixty-four percent were "in favour" compared to the TOTAL HAMILTON average of 59%. The analysis of the SIA indicated that renters, particularly those in high-rise apartment zones, are disproportionately in favour of the proposed ICTS. Ward 2 has a large number of residents living in high-rise apartments. In the UPPER CITY, the proposed alignment is on the boundary between Ward 7 (51% opposed)* and Ward 8 (59% in favour)*. The estimate for all of Ward 2 residents (from a sample of 50 respondents) is that, with 95% confidence, between 51% and 77% are in favour of the proposed ICTS.

*NOTE: When the UPPER CITY and LOWER CITY samples are compared, there are no statistically significant differences. Therefore, Hamilton is not split on the issue in an Upper City/Lower City basis. When the supplemental cases are added, the actual percentages in the UPPER CITY sample are:

Ward Six	-	52% in favour	48% opposed
Ward Seven	-	49% in favour	51% opposed
Ward Eight	-	59% in favour	41% opposed

Thus, the geographical split on the issue is that the three "inner wards" (i.e., above and below the Mountain) tend to be opposed and the five "outer wards" (i.e., above and below the Mountain) tend to be in favour.

TABLE 6.3

PREDISPOSITION OF HAMILTON BY WARD
(September, 1981)

Predisposition	One	Two	Three	Four	Five	Six	Seven	Eight
	%	%	%	%	%	%	%	%
Favour	72	64	48	44	70	55	46	64
Opposed	28	36	52	56	30	45	54	36
Total	100	100	100	100	100	100	100	100
(Base)	(54)	(50)	(48)	(52)	(66)	(49)	(56)	(56)

Significance = .008

6.3 Briefs From Community Organizations

A number of briefs were submitted to the Region by community organizations and special interest groups expressing their opinions on the proposed ICTS alignments.

The following is a list of those who made submissions:

- The Talus Group
- The Durand Neighbourhood Association Inc.
- Clear Hamilton of Pollution, Inc.
- Local Architectural Conservation Advisory Committee
- Hamilton Automobile Club Annual Report, 1979
- Hamilton Young Women's Christian Association
- Hamilton Branch Ontario Society of Occupational Therapists
- Residents of Upper James Street
- Residents of Upper Wellington Street, South Bend Road East, Mohawk Road East

Each submission reflected the specific concerns of the organization or group who submitted it. From these, a number of common issues emerged:

- concerned groups want more detailed information, including a detailed environmental assessment report
- actual need for ICTS: residents felt that this kind of system was not appropriate for "small town" Hamilton
- need for ICTS from the Mountain to Downtown, instead of between the core and industrial area
- costs, especially responsibility for continuing operating and maintenance
- environmental impact
- location and appearance of proposed stations
- construction timing
- incidence of physical vibration and noise intrusion on natural environment
- effect of future alignments on the growth of Hamilton, Dundas, Stoney Creek and Ancaster
- loss of scenic views from the levels of the Escarpment
- problems of accessibility for disabled persons
- preservation of existing character and urban fabric, especially significant historic sites and heritage resources

6.3.1 - SPECIFIC CONCERNS OF INDIVIDUAL C.A.C.R.T. GROUPS

The following are specific concerns expressed by the groups represented by C.A.R.C.T. They largely relate to either the long term mandate of the particular group or the project-specific costs/benefits perceived to affect the group.

6.3.1.1 - GROUP: SOCIAL PLANNING AND RESEARCH COUNCIL OF HAMILTON AND DISTRICT

Summary of Major Issues and Group Position:

In their initial memo to the C.A.C.R.T. accepting membership in that group, the Council noted their chief mandate is to ensure public involvement in the decision-making process. They made several recommendations at that time:

i) background reports and information used by UTDC for response to C.A.C.R.T. questions or concerns be provided for C.A.C.R.T. review.

ii) methods and results to date of social impact studies be made available for C.A.C.R.T. review.

iii) the C.A.C.R.T. use formal meeting procedures, pass motions directly to Steering Committee, elect its own chairperson, and be given a written objective from Metro Canada Limited.

In discussion with Council representatives in August and September it was felt that the C.A.C.R.T. is a good representative group for the public most affected by this report. The problem is that the form of information generally available and the red tape involved in getting information have both frustrated the C.A.C.R.T. and created mistrust. It was felt that the Region is improving in its response to the C.A.C.R.T. but often too little and too late. The major public issues in the Council's view at this time are:

i) social and aesthetic impacts of the proposed system;

ii) the nature of the public participation process;

iii) incomplete, delayed and biased information being provided to the public;

iv) the statement of a) the need for an elevated rail system, and; b) the investigation of alternative systems;

v) the involvement of the public in the process of route selection prior to the investigation of the need for a system.

6.3.1.2 - GROUP: HAMILTON AND DISTRICT CHAMBER OF COMMERCE

Summary of Major Issues and Group Position:

The Chamber of Commerce will not formulate a final position on the project until feasibility study reports have been reviewed. The Chamber is trying to remain objective and represent the Municipality as a whole. They are concerned that the need for the project has not been demonstrated, concerned the Regional Council will have made up their individual minds on the project before all the studies are complete, and feel the public information available has been poor. The Chamber wishes to study all reports in detail before taking a position on the proposed system. It is felt that the cost/benefit analysis and alternative modes studies may answer many of their questions. General concerns include how the system fits transportation planning for the Region, costs, ridership, needs and a guarantee of Hamilton sources for materials.

6.3.1.3 - GROUP: DURAND NEIGHBOURHOOD ASSOCIATION INCORPORATED

Summary of Major Issues and Group Position:

Initially this group expressed concern for quality of service, construction impacts, uprooting and altering traditional relationships with the natural environment, streetscape and historical values, the dividing of neighbourhoods and the alteration of growth patterns, as well as effects on prime residential, commercial and institutional properties (i.e., YWCA, MacNab Presbyterian Church and James Street South), general aesthetics and future links.

This group has perhaps offered the most extensive and genuinely constructive criticism of any. Early in the project and with the need assumed as given for the purposes of discussion, they suggested an alternate totally surface route and felt that their recommendations had never been properly considered nor responded to.

Although all (4) routes affected this group's home territory, they selected route "Y" as the least objectionable while pointing out that Route "W" was the most objectionable based on riderships, cost (both operating and capital) to Limeridge, aesthetics (to the finest streetscape of its kind in the Region), escarpment impact, feeder bus system, and consideration of the goals of CAPAC city core recommendations. They feel misinformation, objectivity of the feasibility study, and poor information to both the public and councillors are key issues. Alternate modes have not and cannot be properly considered and the need itself cannot be properly addressed since there are claimed to be conflicting political, transit and development needs. Certainly the need and rationale for route "W" have not been proven and the public information process has been poor.

6.3.1.4 - GROUP: UPPER WELLINGTON & SOUTH BEND & MOHAWK

Summary of Major Issues and Group Position:

The concerns of this group largely relate to the social and neighbourhood effects of an elevated system; the information process (which is felt to be too slow, often misleading, and one-sided), and a feeling that the decision has already been made on the project. The C.A.C.R.T. is felt to have had little effect on project planning and the concern was expressed that Regional Council is not fully aware of the extent of public opposition. Other concerns related to objectivity of the feasibility study, how the system fits into Regional planning, costs, the Regional needs, visual impacts, convenience, and crime. In general, they feel that the decision process is being politically influenced by the Provincial Government.

6.3.1.5 - GROUP: UPPER JAMES STREET - FENNELL AVENUE TO SOUTH BEND ROAD

Summary of Major Issues and Group Position:

Major concerns relate to social and economic impacts on residents along the proposed route. These include the residential nature of the area, property values, aesthetics, shadowing, noise, snow plowing and local traffic effects. In general it is felt that the proposed system is too costly and not currently needed. In general the public information program was felt to be one-sided, often too technical, at times poorly organized, and not responsive to the public. It was felt that C.A.C.R.T. should have had better response to information requests, earlier input to reports, and more involvement in decisions. In general, it was felt that not enough effort has been made to objectively inform the public. The residents of Upper James would like to be offered fair compensation for their properties if the rapid transit does go in or the possibility to change zoning so that the properties can be utilized commercially.

6.3.1.6 - GROUP: LOCAL ARCHITECTURAL CONSERVATION ADVISORY COMMITTEE (LACAC)

Summary of Major Issues and Group Position:

LACAC has three central mandates relevant to this study: preservation of historical buildings from direct or visual intrusion impacts, preservation of the existing urban environment and streetscapes with special emphasis on historically significant districts, and to avoid further encroachment on the escarpment. Their major project specific concerns include:

- Whitehern: Although route modifications have lessened the direct impact, visual vistas of this building and its surroundings are still affected.

- MacNab Presbyterian Church: The visual effects will be considerable.

- James Street South: Route conflicts with the special zoning status given this street in 1958 to protect and preserve the area.

- King William Street: Visual effects on buildings in general.

- TH&B Station: Although less sensitive due to its modern style.

- General Urban Environment: Overall social impact. Visually it is felt that the system could have been designed to fit better into the urban development.

- Information: The lack of information on the project has resulted in little criteria available for an objective evaluation of pros and cons.

LACAC does feel several project decisions have been beneficial from their point of view: A tunnel rather than surface route down the escarpment, avoiding the Gore Park area, moving the route back from Whitehern, and avoidance of the Upper Wellington route.

6.3.1.7 - GROUP: THE CONSUMERS' ASSOCIATION OF CANADA - HAMILTON AND DISTRICT BRANCH

Summary of Major Issues and Group Position:

The Consumers' Association of Canada, Hamilton and District Branch, wishes to register its opposition to the proposed UTDC transit system. We have several objections:

- The population of the City of Hamilton is declining and the need for such a system is unproven.

- The technology has not yet been shown to be commercially sound.

- The proposed system is extremely inflexible.

- The segregated right-of-way will be an eye sore, a blight on the neighbourhoods through which it passes.

- Should the system fail, removal will be extremely expensive and it will be impossible to restore the original landscape.

- The system is not accessible to disabled persons.

- The driverless vehicles will become an ideal situation for threatening or criminal attacks upon riders.
- We suspect the initial capital costs and operating losses have been grossly underestimated and taxpayers are not interested in bearing any costs in these times of excessive inflation.
- Finally, we believe that if the people of the City of Hamilton were to vote in a referendum, they would turn down the UTDC System.

6.3.1.8 - GROUP: ONTARIO SOCIETY OF OCCUPATIONAL THERAPISTS

Summary of Major Issues and Group Position:

The Society feels the system should be designed to be totally accessible to people in wheelchairs. It is felt to be most appropriate in this the International Year of the Disabled. It is also felt such a system would benefit many others such as geriatrics, persons with heart conditions, women with small children, etc., and generally increase ridership. The DART system is not felt to be totally parallel. The Society would be pleased to help in such design characteristics and feels such professional help is essential for a usable accessible system. There is a feeling of frustration that such an offer has not been responded to.

6.3.1.9 - GROUP: TALUS GROUP

Summary of Major Issues and Group Position:

In addition to expressing concerns relevant to all of the general public issues and overall social impacts along the route the Talus Group has a number of very specific issues related to impacts on the Corktown area, which are summarized below. This Group was specifically formed in January 1981 to respond to this project, and has been one of the most active public groups from the start. Initially commencing as an objective group to facilitate information exchange it feels that it has become more and more against both the project and study process. They are strongly opposed to the selected route "W".

Specific issues include:

- Traffic problems at James Mountain access, James Street South, lower portal area. Winter access to the Corktown Neighbourhood is already hazardous with any visibility problems created by route "W" only increasing this problem.
- Vandalism and crime problems have occurred in the stairway-greenbelt area and the feeling is that this will increase with the transit system.
- Local neighbourhood disruption, social impacts, and property values.
- Effects on Whitehern and small local parks in the southern portion of the route.
- The information process and usefulness of C.A.C.R.T. involvement.

6.3.1.10 - GROUP: BRUCE TRAIL ASSOCIATION

Summary of Major Issues and Group Position:

The Association does not feel the project will significantly affect the Bruce Trail, however, they recommend every effort to accommodate an aesthetic blending with the natural environment especially in the greenbelt lower portal area at the base of the escarpment. Although they feel that rapid transit is needed as an alternate to car travel, they feel that indepth studies should identify the best possible alternative to benefit the Region. The decision should be made by objective experts. There is some concern that the present study does not fully meet these criteria. The Association emphasizes that access to and along the trail, which crosses the James Mountain Access running east on the north side and west on the south at the portal location, should be accommodated in the detailed design. Every effort should be made to mitigate against environmental impacts.

6.3.1.11 - GROUP: HAMILTON AUTOMOBILE CLUB

Summary of Major Issues and Group Position:

The Club's mandate is to protect and serve the interests of the area's motoring public. A good public transit sytem is important to the community. Club policy supports development of a balanced transportation system. Limited financial resources for transportation places higher priority on other transportation projects now and in the near and mid-range future. Specific concerns can be summarized in four areas:

- Costs: cost of operation of the short demonstration system now under consideration and the even greater cost, both operating and capital, of future extensions will have a negative impact on the implementation of need-identified transportation projects such as the Perimeter Road, the North-South East-West Mountain Corridor and the Burlington Skyway and the ongoing maintenance requirements for the existing roadway network.

- Effects on Route Residents: negative impact on downgrading of visual environment; negative impact on quality of life, property values, and social interactions; difficulty of integration with existing transit routes and decreased transit convenience for many.

- Traffic Problems: reduced lanes and their indirect effect on usefulness of major Mountain Access Routes already in place, safety problems on guideway streets, induced traffic on neighbouring minor residential streets and access for emergency vehicles.

- Need and Rationale: the lack of flexibility of fixed rail systems for route changes or special events. Technology, when and if a need for the proposed system is clearly shown, may be much advanced over the latest available today. The failure of such systems as BART (San Francisco) to meet projections. Claimed time savings appear to relate to existing bus service without possible future operational or equipment improvements. Correlation with overall regional transportation plans is essential. Responding to opportunism with its major commitment of funds and impact on the urban streetscape is unwise.

6.3.1.12 - GROUP: MOUNTAIN PLAZA MALL MERCHANTS ASSOCIATION

Summary of Major Issues and Group Position:

The opinions expressed by this group ranged from a feeling that it would benefit business at the mall to a feeling that mall parking would be filled by people going downtown to shop. The major concerns were loss of parking through both construction and commuter use, the feeling that the local benefits or system need had not been proven, the potential for local shoppers to be attracted to larger downtown stores, and the general Regional costs/benefits of the system.

6.3.1.13 - GROUP: DOWNTOWN BUSINESS ASSOCIATION

Summary of Major Issues and Group Position:

It is felt that the Central Business District (CBD) needs help. The parking access at suburban malls and traffic flow engineering in the CBD harm the competitiveness of small CBD businesses. Rapid transit to the CBD would help this. Subsidies are required for all such systems but the overall benefit/cost to Hamilton will be positive. It is felt that the complete industrial bayfront to Limeridge Regional Subcentre System would have been better but doubt was expressed that this will occur. It was also felt that better, more understandable public information would result in stronger support for this project.

6.3.1.14 - GROUP: CLEAR HAMILTON OF POLLUTION (CHOP)

Summary of Major Issues and Group Position:

The mandate of the group is to increase public awareness about pollution and encourage informed responsible action in Hamilton. Related to this aspect, the UTDC Rapid Transit System will not significantly lessen the current degree of pollution from traffic. Although not directly related to this mandate the visual negatives of an elevated transit is a concern.

Their major concern relevant to this Project is that this system has not been compared to other systems in meeting the transportation needs of the total Region.

Broader concerns are the continued activities of Project staff to co-opt the public rather than get input based on balanced information of the pros and cons of the System and obtaining genuine participation involving as broad a segment of the community and Region as possible. The feasibility study is biased and sales oriented while C.A.C.R.T. and public participation in general has been kept ineffective. The results of the Social Impact Survey are hoped to at least partly rectify this latter concern.

6.3.1.15 - GROUP: BERRISFIELD PARK COMMUNITY COUNCIL

Summary of Major Issues and Group Position:

Initally the group was supportive of a transit system to the Limeridge Regional Subcentre, but strongly questions the need or rationale for a shortened route. They also feel route "W" is the poorest alternative. There is a strong doubt that future links or express bus co-ordination will occur and consequently the current public transportation system is felt to serve this area better than the proposed UTDC route. There is also a strong feeling the C.A.C.R.T. is not given adequate response or consideration by the Region and in fact it is felt to be only a public relations "window dressing". It was felt the Region should take every measure possible to facilitate C.A.C.R.T. review of final feasibility study documents and to incorporate views of C.A.C.R.T. as public representations in their decision on the project.

6.3.1.16 - GROUP: HAMILTON SOCIETY OF ARCHITECTS

Summary of Major Issues and Group Position:

The system should be designed to aesthetically fit within or enhance the local visual environment. Detail design should maximize this aesthetic fit. Concerns expressed related to cost and rationale for the proposed route. It is generally felt these have not been explained properly. In general the public participation program was felt to have attempted every feasible way of involving the general public but with little success due to apathetic feelings of people not directly on the route.

6.3.1.17 - GROUP: WELLINGTON AND MARY BUSINESS ASSOCIATION

Summary of Major Issues and Group Position:

Although it is felt that downtown businesses require planning help to remain viable, the proposed route is not seen to improve the situation. A route to help downtown businesses would have been run from a major residential area, and would have been carefully co-ordinated with City and Regional zoning as well as planning for future development. It is felt that the proposed system was planned as a demonstration and then an attempt was made to fit this to the Regional need or rationale instead of establishing the need and benefits to the Region first and then planning the best route to meet these. Specific concerns related to potential loss of business to shopping malls, overall and long-term costs, aesthetics, snow problems and Regional need. They are also concerned about the potential tax burden on city residents.

6.4 Regional Response to Expressed Public Opinion*

The following summarizes the general public issues related to the proposed ICTS Rapid Transit project as expressed through the C.A.C.R.T., in briefs, through the media, and in the Connor reports which analyzed Open Houses, questionnaires, and newsclippings.

The major issues were categorized in five topic areas:

1) the need or rationale for the proposed ICTS route;

2) the current and long-ranged costs of the project;

3) the usefulness of C.A.C.R.T.;

4) the objectivity of the feasibility study and subconsultant reports; and

5) the effectiveness of the public participation program.

Issue 1: Project Need and Rationale

This concern relates primarily to the north-south corridor and the short length of the preferred route. Comments generally related to the following:

- the greater need for an east-west link;

- the value of a route from one business district to another;

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* An independant evaluation of the Public Participation Program was conducted by Beak Consultants and their analysis of public issues is presented in this section. The response to the issues identified by Beak was prepared by the Regional Municipality of Hamilton-Wentworth and their consultants.

- the reason for building the system now if the transportation need is not projected for 15 or 20 years;
- the relevance of the project to City's/Region's plans for transportation and future growth;
- doubts that future growth will occur in the planned patterns;
- guarantees for future links, express bus connections, integration with other transportation modes;
- whether this system is the best, most efficient way of meeting Hamilton's transport needs; and
- why the Limeridge connection was abandoned.

Issue 1: Project Need and Rationale: Regional Response

The Regional Municipality of Hamilton-Wentworth, and before it the City of Hamilton and the Hamilton Street Railway, have been examining the community's transit needs since the late 1960's. A series of reports have been issued on the subject, and each has been the focus of public and political scrutiny and debate:

1973 - City of Hamilton - Hamilton Transportation Strategy Study

1976 - Transportation Development Agency (Canada) - A Study of Existing Rights-of-Way for Intermediate Capacity Transit Applications in Canadian Cities - Hamilton

1976 - City of Hamilton, Hamilton Transit Commission and Region of Hamilton-Wentworth - The Recommended Priority Corridor Within the Basic Trunk Network.

1979 - Region's draft Official Plan stated high priority for rapid transit in the Mountain Corridor.

Each of these reports were built on the findings of its predecessors, and the overall findings were summarized and incorporated in the Region's draft Official Plan in 1979. These findings were primarily:

a) Because employment in Hamilton's downtown was going to grow more quickly than employment in the bayfront industrial area, and because the density of employment locations would be much higher in the downtown, any rapid transit system constructed would have to serve the downtown area.

b) Because the area of most rapid residential growth would be on the central Mountain, because a commercial/retail/residential growth mode was planned for the central Mountain, and because transit ridership from the central Mountain to downtown was already very high, the corridor joining the central Mountain to the downtown should be the first to receive rapid transit.

c) Because the desire and policy to preserve the environmentally attractive characteristics of the Niagara Escarpment, it would not be possible to construct any substantial future increases in road capacity in the central escarpment area. Given this constraint, all available cross-escarpment road capacity would be used up by the early - to mid - 1990's, and a rapid transit system would be required to be in service at that time in order to serve the transportation demand in the corridor that could not be served by roads.

These findings were accepted as Regional policy by Regional Council.

This Official Plan and its statement of Regional policy were the starting point for the current rapid transit study. As the first step in the study, Regional staff presented the above findings to Council in the spring of 1980, and asked Council to re-confirm the policy and approve the North-South central Mountain corridor for the study of Hamilton's first rapid transit link. Council publicly confirmed this in May 1980, and the information and rationale have been presented at every Open House (October 1980, January, March, May, June, 1981) associated with the study and in several study reports (e.g., Rapid Transit Rationale: Summary of Findings) which became publicly available as early as spring, 1981.

The above represents the transportation (future road conjestion) rationale and the location (north-south Mountain) rationale for considering the proposed project. There are also economic, developmental and demonstration reasons for considering the project, and in particular for considering it in the early 1980's as a pre-build rather than in the late 1980's when a go-ahead for construction will have become a transportation necessity.

Economically, the project represents an opportunity. Because of the attractive funding offer made by the Province of Ontario, the municipality has the opportunity to implement a project which could create an substantial influx of capital into the community, with its attendant job creation and economic multiplier effects at a time of economic slow-down. It also provides an opportunity to offer residents an increased range of transportation choice at a time of spiralling costs of automobile ownership and operation, resulting particularly from substantial increases in the cost of gasoline.

From a development point-of-view, early construction of a rapid transit system can offer two benefits. The first is the ability to influence the pattern of development that would occur with or without the rapid transit system. This is especially important in the downtown where both the City and the Region agree that growth in the downtown should be encouraged to the east of James Street. The second benefit is the attraction of new development to the community in reponse to the improved mobility along the transit route. This is of interest to the Region as it has intensified its efforts (e.g., the creation of the Economic Development Department) in recent years to market itself in competition with other municipalities. These two potential benefits together form the development rationale for considering the project.

The demonstration of the transit technology is also part of the total rationale for the project. While the provincial interest several years ago in demonstrating the ICTS in an urban application may have been partly responsible for the funding offer made to the Region in 1978, that interest appears to have become less urgent as other cities (e.g., Vancouver, Scarborough, Detroit, Los Angeles) have accepted the system and some have contracted for its construction. Notwithstanding these more recent events, the provincial offer has stood until the completion of this current study, and the Region has the protection of knowing that it will not be the first city to use this system, while it considers whether some of the demonstration aspects of the proposed system could be of significant benefit to the Region. Notable among these is the use of steel as the primary guideway structural member.

Each of the above three rationales for considering the proposed project represent reasons for considering the project at this time, some six to eight years prior to its need for purely transportation reasons. These represent the pre-build rationales, and they have also been presented at all of the project Open Houses and discussed in several of project reports.

Questions of the integration of the rapid transit system with the rest of the transportation system and of the efficiency of the ICTS under study relative to the Region's needs and other ways of meeting the needs are the subjects of various reports that the Regional staff have instructed the consultants to prepare. The information in these reports has been made available as it has been prepared. For example, drawings and maps showing local and inter-city bus integration were publicly available at the June and July 1981 Open Houses, and the alternative transportation modes to be studied were provided to the C.A.C.R.T. soon after they were confirmed by the Region's Technical Committee.

Issue 2: Costs

There is considerable misunderstanding of the proposed cost sharing agreement. Comments related to:

- guarantees of 90% federal/provincial subsidy - especially if the federal government decides to not be involved;

- guarantee of subsidies for operating losses;

- guarantee for financing of future links, connecting express systems, etc. (i.e., will it go beyond the up-the-mountain demonstration stage);
- guarantee for subsidization of cost overruns;
- ultimate cost/benefit to Region;
- effects on property values and whether Region will offer market or replacement value for people who wish to move; and
- effects on downtown stores.

Issue 2: Costs: Regional Response

The normal provincial subsidy available to every Ontario municipality for the purchase of all transit equipment is 75%. Thus, the provincial government would pay 75% of the capital cost, while the municipality would pay 25%. In September 1978, the province made an offer for special funding assistance for the construction of I.C.T.S. in an interested Ontario municipality. This offer was contingent on the municipality assuming 10% of the capital cost and on federal participation with the province in sharing the remaining 90%.

Hamilton-Wentworth advised the province it was interested in considering the offer, and Regional Council and the Hamilton Street Railway passed resolutions to that effect. In January of 1980, when the federal government had still not formally responded to the provincial offer, the Region asked and the province agreed to fund totally the $3 500 000 cost of the current study. The context in which this study is being undertaken is that 90% of the capital cost would be funded by the two senior governments: the Region would be responsible for only 10% of the cost.

This offer, and Ontario's continuing commitment to it and the federal government's continuing indecision, has received extensive media coverage from 1978 to the present time, and has been noted in almost every public advertisement, brochure, and announcement associated with the project in the past year, and has been described on panels at every Open House. It is noted in the public contracts setting out this study and is used in the study's economic calculations. If the Region decides to proceed with construction of the system, this funding offer will be the basis of municipal/provincial/federal cost-sharing negotiations, as it has already been discussed and publicly reported at meetings of the three groups.

There has been no change in the status of this offer during the course of this study: the offer and its status has been described to the public at every opportunity.

Several subsidies are also available to cover operating losses, and these have been described to C.A.C.R.T., to the public and to Regional Council. All transit services in Ontario are eligible for operating subsidies based on their population. These subsidies would apply to the operation of the ICTS. In addition, special subsidies are available to municipalities that implement rail rapid transit systems in advance of transportation need, provided that they are doing so to accomplish other policy objectives (e.g., development), and provided that they take reasonable steps to encourage use of the rapid transit. The purpose of these subsidies is to reduce the municipal losses incurred by the rapid transit system that are over and above those that would have been incurred to carry the transit passengers by bus, to zero. The system proposed for the Region is eligible for these subsidies, and the consultants have been instructed to prepare their designs to ensure this eligibility.

The province has on two occasions, verbally and in writing, advised that these subsidies would apply to this municipality, and the media has carried the story both times. In addition, this information has been available on panels at the July Open Houses, in study reports, and in recent project literature, including the August 1981 fact sheet. In addition, C.A.C.R.T. members were advised in mid-summer that a Region-Province commmittee had been established to discuss the details of the operating subsidies, and were informed of the membership of the committee.

The public has also been advised via the Open Houses, study reports, television shows and reports to Regional Council that the economic effects of the implementation of this system were under study in the economic impact assessment study. Particular note was made in May 1981 of the fact that a policy of guaranteed market-value purchase of residential properties along the route, at owner option, was under study.

Issue 3: Usefulness of C.A.C.R.T.

There is a feeling by most C.A.C.R.T members that the committee is ineffective and essentially a window-dressing. Even the pro-project or neutral members feel frustrated and expressed feelings against the way in which the committee functioned. The following comments illustrate these sentiments:

- complaints about the time spent at C.A.C.R.T. meetings on explanations of why members have quit attending committee meetings;
- feelings that recommendations and questions are often ignored;
- feelings that answers given are often over-simplistic and misleading;
- the desire to have some involvement in report review and decision-making process prior to the general public; and
- a general expression of distrust.

Several important points should be made about C.A.C.R.T. First, if this project goes to EA public hearings, it is essential that the Region demonstrate constructive public involvement. If C.A.C.R.T. complains that they were misused, the Region's credibility could be destroyed. Now that C.A.C.R.T. exists it must be used constructively. Second, C.A.C.R.T. appears well balanced. The problem is that those who appear for the project or neutral have become, in several cases, disenchanted with the public participation process and consequently, strongly critical of both Metro Canada and the Region. One might say that the process has alienated some members rather than balancing pros and cons in a constructive manner, which was the "rationale" proposed by Connor. Third, in a setting of general apathy, the C.A.C.R.T. represents the majority of the interested public. Every effort should be made to involve them usefully and respond to their concerns. The fourth point is that by knowing the concerns of the public relevant to the project, the Region can be prepared to respond to them at public hearings as well as integrate solutions from them, where feasible, into detailed design.

Issue 3: Usefulness of C.A.C.R.T.: Regional Response

C.A.C.R.T. was established by Metro Canada as an advisory committee, rather than a decision-making body (a function reserved for Regional Council), representing a cross-section of community interests in the Region. C.A.C.R.T.'s advice was sought by Metro Canada in order to improve the designs being produced to make them more responsive to community concerns and to provide a sounding board for public input on issues surrounding the transit proposal. The Region insisted, however, that C.A.C.R.T., as a public group, was subject to the normal procedures regarding information flow as they applied to every other group: study information was first to become public at Council Committee (the ICTS Steering Committee) before public distribution.

The Region had hoped to participate with C.A.C.R.T. at its meetings, but was barred by C.A.C.R.T. from doing so. C.A.C.R.T. also decided at the outset to restrict the distribution of its minutes and, specifically, not to send them to the Steering Committee. Communications between the Region and C.A.C.R.T. were thus made difficult in the early month of C.A.C.R.T.'s existence. The problem was further compounded when C.A.C.R.T. insisted, through its Chairman that Metro Canada's function was as a meeting resource rather than as a meeting participant, and that its agendas be developed internally.

In practical terms, it appears that C.A.C.R.T. was initially more concerned with matters of procedure rather than substance, and was under the rather close control of its Chairman, and later its Co-Chairman, during its early meetings.

After the resignation of Connor Development Services as the public participation consultant in May 1981, the process opened up considerably. C.A.C.R.T. reversed its earlier decisions and invited the Region to its meetings, first staff and then later political representatives, and insisted that its minutes be distributed to the ICTS Steering Committee. C.A.C.R.T. invited the media to its last three meetings although they only came to the first of the three. The result of these changes was that the transfer of information was facilitated, and C.A.C.R.T. became an advisory body to both Metro Canada and the Region.

C.A.C.R.T. meetings continued to be preoccupied by procedural items, however, and the Committee was able to give very little advice with respect to questions confronting the study. On only one occasion - a recommendation that the Region seek 90% funding for the ICTS line all the way to Limeridge Mall - was the committee able to reach a concensus on a transit issue under discussion. Often, matters were deferred from meeting to meeting or referred to sub-committees rather than being dealt with. On other occasions, members felt constrained either by their organization's mandate or by their legal advisors to refrain from making specific statements about issues. The result was that often the Region (and Metro Canada) had to act without benefit of the clear C.A.C.R.T. input it had hoped to have.

On occasion, also, the Region had to weigh C.A.C.R.T.'s inputs with other factors, and take actions which were not exactly in parallel with C.A.C.R.T.'s wishes. An example would be the hiring by the Region of both of the two replacement public participation consultants shortlisted by the C.A.C.R.T. consultant review sub-committee, rather than just the one eventually recommended. This does not represent a recommendation ignored, but rather an occasion where the Region had to take a broader perspective than exercised by C.A.C.R.T.

In balance, Metro Canada or the Region or both acted on virtually every C.A.C.R.T. recommendation that called for or suggested some action, and provided all information requested that could be made publicly available. C.A.C.R.T. questions were answered openly and accurately, and when answers were not available C.A.C.R.T. was advised why and when they would become available. It is apparent that many of the concerns over lack of information stemmed from a lack of understanding by C.A.C.R.T. members of the study process and of the fact that new information was constantly being developed, reviewed, and made available as the study progressed.

It is the Region's view that much of the distrust and suspicion that developed occurred as a result of the charges made in the media by Connor Development Services when that firm resigned as the public participation sub-consultant. Although subsequent investigation by the Region, Metro Canada and by Mr. A.T.C. McNab have shown the charges to be unfounded and much of the information distributed at that time to be erroneous, the impact of the Connor charges on some members of the public was to create misunderstanding and distrust. While C.A.C.R.T. itself did not specifically echo any of the charges, it is clear that they reflected, and in some cases encouraged through the media, these feelings of distrust. This further hampered the Region's and Metro Canada's attempts to seek concensus advice from C.A.C.R.T.

Issue 4: Objectivity

The objectivity of the feasibility and environmental assessment study process was disputed by almost all C.A.C.R.T. members. First, there is a misunderstanding of the purpose of a feasibility study. Much of the public sees this as the final detailed stage and thus do not understand why all questions cannot be promptly and precisely answered nor why some answers can change as the study progresses. The provincial environmental assessment includes many safeguards designed to ensure objectivity. This was questioned by some but not understood by most. The relationship of the Provincial Government to MCL and UTDC to the study was criticized and many feel the Region is merely a further extension to this relationship. In general, many groups expressed feeling that this is a "pet project" of the Premier and that the Region is being politically forced to approve it. The Region is not seen as a separate entity and its role in the study is largely misunderstood.

Issue 4: Objectivity: Regional Response

The roles of the various governments, committees, agencies, and companies involved in the study has been described on panels graphically and textually at every Open House and in several of the study brochures and reports. The key element in all of the various relationships that exist is that the decision as to whether to proceed with construction of the rapid transit system lies totally with the Regional Council. The involved public is aware of this.

During the course of the study, both municipal and provincial political figures have spoken concerning the Region's decision authority. Many Council members, whether supportive, uncommitted or opposed to the rapid transit proposal have publicly assured their constituents that they and they alone would make the decision. These statements have been widely covered in both print and electronic media. In addition, Premier Davis of Ontario, in a speech in the Region and in a letter to the Regional Chairman, stated categorically that the Province understood and respected the right of Regional Council to make the decision and had no interest or intention in influencing the decision. It is apparent, however, that many people do not accept these statements.

The other question relating to objectivity relates to the fact that Metro Canada, the prime consultant on the study, is a subsidiary of the Urban Transportation Development Corporation, the developer of ICTS, which is in turn owned by the Province. In as much as the funding offer for the project and the study is tied directly to consideration of the ICTS and in as much as the Region's interest in ICTS stems from the fact that it appears to be capable of meeting the

Region's transit needs and given the fact that Metro Canada would have to be very heavily involved in any study of ICTS, the Region believes the hiring of Metro Canada to manage the study was the correct and most efficient approach. This decision was made by Council in the spring of 1980, and the contractual terms approved by Council in the summer of 1980.

The Region is safeguarded against any possibility of the study being affected by a conflict between its objectives and Metro Canada's objectives in three ways. Firstly, much of the study not relating specifically to the technology (e.g., demand estimation; soils testing) was done by independent consulting companies. Sixteen such firms were hired by Metro Canada to work on the study. Secondly, all work prepared by either Metro Canada and its sub-consultants is reviewed by Regional staff through the Technical Committee. Thirdly, the entire study and project is subject to review and approval under the Environmental Assessment Act.

Issue 5: Public Information

In general, the study process is perceived to be a public relations exercise. Several points were mentioned repeatedly by public groups and the media:

- all information is one-sided, only emphasizing the good points,
- misleading or incorrect statements, although often minor add up to a significant degree, and
- public involvement has been limited.

Beak Consultants (who were hired to provide an independent evaluation of the Public Participation Program) feel there are several groups which have had within their mandate the responsibilty of providing the public with objective information relevant to this study. Some comments on how each of these groups has met this responsibility as perceived through Beak's review of materials follows:

a) Region: Although there is no apparent legal responsibility to inform the public, Region, under the leadership of its elected Council, is felt to have the moral responsibility of keeping the public informed as to how citizens are being served. At the same time, as clients for the feasibility study, Region has the responsibility of ensuring that the studies completed by Metro Canada and its sixteen sub-consultants are technically correct and in the best interests of the citizens it serves. Beak cannot think of a feasibility or environmental impact study, in our experience, which had not undergone internal client review prior to publication. Region has created internal Technical and Steering Committees to perform this function. Region appears to be caught between several mutually exclusive goals informing the public expeditiously, ensuring all public information is correct, maintaining established information flow patterns, and responding to the personal political views of its Council.

b) Metro Canada and its Sub-Consultants: In Beak's experience public information is normally the responsibility of the client, not the contracting engineers or sub-consultants. Feasibility study engineers will normally provide technical information on project design, costs, and implementation procedures, but this is normally done only through the client. Similarily, public participation sub-consultants usually work with client review and approval of public information releases. In an attempt to speed up release of information and due to scheduling and Regional manpower, much public information has included technical design fact sheets, the type of information one expects from a feasibility engineer or product designer. It has been seen by the public to lack the balance of impact study results largely due to the fact that these other studies must go through the Regional review channels.

c) Public Participation Consultant: Beak feels a major responsibility of the Public Participation Consultant is to ensure a two-way flow of information. Much of the program carried on prior to Beak involvement has been, by design, one-way. In the limited time since Beak involvement, several public participation methods to ensure two-way, constructive involvement have been accepted by both C.A.C.R.T. and Region:

- A summarization of key issues at the end of C.A.C.R.T. meetings with Region to provide responses by the following meeting;
- The report review workshop;
- Written responses to significant issues specified by individuals or groups;
- Written responses to issues documented in this report;
- Consideration of alternative public involvement measures if the study continues;
- Regional involvement in C.A.C.R.T. meetings (which occurred prior to Beak); and
- Involvement of C.A.C.R.T. in decisions re: public participation (i.e., selection of a new public participation consultant, and the workshop program).

d) Social Planning and Research Council: Through its Community Development Advisory Committee, the Council has as their chief mandate ensuring public involvement in the decision-making process. The Council has made good general recommendations relevant to the public participation program and has been vocal in criticizing instances where these general recommendations have not been followed. They have also supplied help in organizing the workshop format. It is felt that the expertise of their professional staff could have been used more constructively if a mechanism were available for more specific and constructive recommendations relevant to developing public participation programs rather than the Council being primarily involved through after-the-fact criticism of these programs.

Issue 5: Public Information: Regional Response

The Region has had the responsibility, throughout this study, for releasing information for public distribution by Metro Canada and its sub-consultants. In addition, all information released for distribution has been approved by the Region prior to its release. This policy has applied consistently to all reports, brochures, Open House materials, advertising, press releases, fact sheets, etc.

The Region is satisfied that the information distributed has fairly presented the positives and negatives associated with the study. During the course of the study, those complaining of one-sided information have usually been unable to provide specific examples. In addition, Metro Canada has for some information been both too positive and too negative. Often, the judgement as to whether information is too positive or negative has been dependent on the individual's assessment of the implications of that information rather than on the information itself.

The Region is unaware of any inconsistent, misleading or incorrect information that has emanated from the study. (Statements by Regional officials not involved in the study, by Metro Canada staff not involved in the study, or by provincial officials not involved in the study suggesting that a decision to construct had already been made were unfortunate and untrue, and were quickly corrected by study officials). On occasion, information has changed during the course of the study, as preliminary analysis is superceded by more detailed analysis and decisions, some by Council, after the course of the study. This is a pitfall associated with releasing preliminary information in the midst of a study, and all information released has been identified as to its status and state of review.

The Region agrees that public involvement has been limited, not because it has been restricted, but because of an apparent high level of apathy towards the project. In association with one set of Open Houses, only 725 responses were received in total to a display advertisement and reminder notices in the "Spectator", advertisements in the weekly papers, 55 000 brochures distributed door-to-door, 35 000 brochures distributed over all HSR bus routes, and widespread media attention. Most of those responses were from people living in close proximity to one of the proposed routes, and from people who had previously responded repeatedly. During the course of the study, many different techniques have been used to attract attention, interest, and participation in the study, but without significant success. The study has, however, been well followed by a small group of people either strongly in support or opposed to the proposed project.

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DB. Tl. 6 - Saltfleet Community Development: Final Report Public Transportation Feasibility Study
DB. Tl. 7 - Inter-Regional Bus Transit Study, Oakville - Hamilton
DB. Tl. 8 - Programmatic Research Approach to Transit Marketing
DB. Tl. 9 - HSR Maintenance & Storage Facilities Investigation
DB. Tl. 10 - Public Transit & Industry 1980. (Thesis Paper)
DB. Tl. 11 - 3rd Annual Report of HSR, 1979
DB. Tl. 12 - Ridership at peak load points
DB. Tl. 13 - HSR Bus Route Map & Schedules, includes Canada Coach
DB. Tl. 14 - Transit Studies, Origin-Destination Survey of Hamilton Mountain Corridor
DB. Tl. 15 - The Canadian Urban Transportation Industry
DB. Tl. 16 - Scarboro Town Centre Light Rail Transit

DATA BANK INDEX

TRAFFIC AND TRANSPORTATION STUDIES

DB. T2. 1 - Traffic Management Systems Study, Hamilton Traffic Dept.
DB. T2. 1A - Traffic Management Systems Study, Vol. 2
DB. T2. 2 - Feasibility Study of Lloyd D. Jackson Parking Garage Jan 1972
DB. T2. 3 - King Street Mall, 1972
DB. T2. 4 - Bikeways-Hamilton
DB. T2. 5 - Central Area Transportation Plan. 1978, on going Central Area Plan
DB. T2. 6 - Land Use and Transportation Study - Hwy 6, Glanbrook
DB. T2. 7 - Engineering and Route Feasibility Studies
DB. T2. 8 - Impact of Trans. on the CBD
DB. T2. 9 - Highways designated as snow emergency routes in the City of Hamilton
DB. T2. 10 - Hamilton Truck O.D. July '73
DB. T2. 11 - Traffic Control in Construction Areas - Manual
DB. T2. 12 - Design of Entranceways
DB. T2. 13 - Turning Movement counts within the Corridor
DB. T2. 14 - A.T.R. Counts of screenlines surrounding Corridor
DB. T2. 15 - Road Needs Study, County of Wentworth
DB. T2. 16 - Regional Road Study, Progress Report 2
DB. T2. 17 - City of Hamilton Road Needs Study
DB. T2. 18 - Parking Lots in the Downtown
DB. T2. 19 - City of Hamilton Street Inventory
DB. T2. 20 - Hamilton Central Area: Open Space, Urban Landscape and Pedestrian Traffic
DB. T2. 21 - East-West Artery Plans (Standing File)
DB. T2. 22 - Heavy Truck Routes (Plan)-Hamilton
DB. T2. 23 - Travel Time Contours from Hamilton General Hospital

DATA BANK INDEX

TRANSPORTATION SUBSTUDIES OF THE REGIONAL OFFICIAL PLAN

DB. T3. 1 - Report 1 - Iventory, Oct '75, Regional Planning
DB. T3. 2 - Report 2 - Travel, Characteristics Survey, Oct '75.
DB. T3. 3 - Report 3 - Development of a Travel Forecasting Model Oct '76 Regional Planning Dept.
DB. T3. 4 - Report 4 - Transportation Impacts of Development Alternatives Oct '76 Regional Planning Dept.
DB. T3. 5 - Report 5 - External Travel Impacts Study
DB. T3. 6 - Substudy #6 of Official Plan: Transportation Capital Facilities Plan (draft version)

DATA BANK INDEX

UTILITY DATA

DB. Ul. 1 - Union Gas Detailed Drawings Showing Gas Mains within the Corridor
DB. Ul. 2 - UNION GAS: Gas Main Locations Showing Potential Planning Problems
DB. Ul. 3 - Traffic Signal Interconnect Locations
DB. Ul. 4 - 1979-1984 Storm Sewer Separation Program
DB. Ul. 5 - H.S.R. Overhead Feeder Cables
DB. Ul. 6 - CABLE TV: Mountain Cablevision
    Hamilton Co-Axial
    Western Co-Axial
    Northgate Cable
    Maclean Hunters
DB. Ul. 7 - Ontario Hydro
DB. Ul. 8 - Telecommunications
DB. Ul. 9 - T.H. & B. Railway Co. Aerial & Buried Plant
DB. Ul.10 - CNR Standard Clearance Diagrams

For Hamilton Hydro See DBL.4

DATA BANK INDEX

AERIAL PHOTOGRAPHS

DBL.1 - GRS00009-63,154 & 114
- GRS80009-62 - N. End of Corridor
- GRS80009-152- S. End of Corridor
- GRS80009-114-Centre of Corridor

DATA BANK INDEX

MAPS, PLANIMETRIC INDEX

DBL. 2 - White Prints & Reverse Sepias Sheet Nos.
7/11A, 7/11B, 7/11C, 7/11D, 7/12A, 7/12B, 7/12C, 7/12D,
8/11A, 8/11B, 8/11C, 8/11D, 8/12A, 8/12B, 8/12C, 8/12D
8/13B, 8/13C
9/11A, 9/11B, 9/11C, 9/11D, 9/12A, 9/12B, 9/12C, 9/12D
9/13B, 9/13C
10/11A, 10/11B, 10/11C, 10/11D, 10/12A, 10/12B, 10/12C
10/12D, 12/13C
White Prints & Reverse Sepias Sheet Nos.
7/11, 7/12, 8/11, 8/12, 8/13, 9/11, 9/12, 9/13, 10/11,
10/12, 10/13

APPENDIX 2

SUMMARY OF REPORTS AND STUDIES
PREPARED FOR THE
HAMILTON-WENTWORTH RAPID TRANSIT
PRE-IMPLEMENTATION STUDY

SUMMARY OF REPORTS AND STUDIES PREPARED FOR THE HAMILTON-WENTWORTH RAPID TRANSIT PRE-IMPLEMENTATION STUDY

ENGINEERING

Generation of Feasible Alignments: Engineering

1980 - Cole Sherman and Associates Ltd.

Purpose

From a review of geological, structural and utility data, in conjunction with the Planning Team, twelve alternative alignments for the rapid transit facility were to be identified with the elimination from further consideration of any alignments that are not feasible, viable or practical.

Recommendation

Thirteen potential alignments were identified linking the Mountain to the Downtown core. For each of these thirteen alignments, a number of permutations and combinations existed, greatly expanding the total number of rapid transit routes.

Alignment Segments Analysis and Evaluation: Working Papers of Engineering Team

1981 - Cole Sherman and Associates Ltd.

Purpose

To analyze the engineering aspects of each segment of feasible alignments, and to provide the results of this analysis to the Evaluation Team for the purpose of synthesizing the analysis for use by UTDC in selecting a recommended shortlist of the most promising alignment alternatives.

Approach Analysis of alignments previously generated by Metro Canada Ltd. and the Planning Team, using existing information, and presentation of results to Evaluation Team. Assumptions were made on:

1. location of the guideway relative to the road allowances
2. that all alignment segments have a similar degree of difficulty
3. that intersections do not require individual study at this time
4. no consideration of station location
5. some consideration of property requirements
6. columns at intersections to be located so as to avoid conflicts with major utilities and services or cross streets
7. impacts of guideway on Limeridge Mall property is not considered
8. guideway to be located within the East-West Mountain arterial right-of-way without affecting existing services

Recommendation The preferred segments were recommended for consideration by the Evaluation Team.

Detailing of Shortlisted Alternatives: Engineering

1981 - Cole Sherman and Associates Ltd.

Purpose To analyze in greater detail the engineering component of the four shortlisted alternative alignments and provide the results of this analysis to the Evaluation Team for the purpose of synthesizing the analysis for use by UTDC in selecting a recommended alignment.

Approach

Using existing information, an analysis of the four shortlisted alignments was conducted, including several mini-analyses for the minor options to the four alignments. Assumptions were made on:

1. existing geotechnical data since the field program was deferred until after this study
2. the most suitable type of tunnel and foundation construction
3. that profiles will be set to provide a standard roadway clearance of 5 metres, except in the CBD where a minimum of 5.5 metres is required.

Recommendation

No recommendation.

Steel Alternative Guideway Study

1981 - Cole Sherman and Associates Ltd.
ABAM
Metro Canada Ltd.

Purpose

To investigate the feasibility of utilizing a composite steel guideway system, rather than a concrete guideway system, for the rapid transit system.

Recommendation

Steel is a viable and competitive material for the guideway system and should be considered in future tender bids.

Preliminary System Description of Recommended Alignments

1981 - Marshall Macklin Monaghan Limited/Hatch Associates
Cole Sherman and Associates Ltd.

Purpose To prepare a preliminary functional plan in sufficient detail that a preliminary implementation plan can be specified, that capital and operating costs can be accurately estimated, that detailed design can follow and with a complete description of the integration with the urban and natural environment.

Recommendation

Rapid Transit Rationale: Interim Report

1980 - Marshall Macklin Monaghan Limited/Hatch Associates

Purpose To review and document the basis for determining the corridor, purpose and implementation timing of the Hamilton-Wentworth Rapid Transit System.

Approach A review of past studies and supporting documents and documentation of the transportation and urban planning rationale for corridor selection, corridor boundary, role of public transit and implementation timing.

Recommendation For transportation, development and technological demonstration, implemenation of ICTS in the Mountain corridor can be supported. For transportation purposes, deferral of commencement of construction could occur until 1988-1992. However, to spur growth in the community and the promotion of Canadian technology, implementation could proceed immediately.

PLANNING

Generation of Feasible Alignments: Planning

1980 - Marshall Macklin Monaghan Limited/Hatch Associates

Purpose

From a review of the transportation and planning components of the Regional Municipality of Hamilton-Wentworth, in conjunction with the Engineering Team, twelve alternative alignments were to be identified for the rapid transit facility with the elimination from further consideration of any alignments that are not feasible, viable or practical.

Approach

Analysis of the transportation and urban planning components of each segment of the feasible alignments including:

1. definition of the differences between the options in terms of their abilities to serve the Mountain residents with the CBD as a travel destination
2. overview the sensitivity of the land uses along each route option to the application of ICTS

The assumptions varied with each route considered.

Recommendation

Thirteen potential alignments were identified linking the Mountain to the Downtown core. For each of these thirteen alignments, a number of permutations and combinations existed, greatly expanding the total number of rapid transit routes.

Alignment Segments Analysis and Evaluation: Working Papers of Planning Team

1981 - Marshall Macklin Monaghan Limited/Hatch Associates

Purpose

To analyze the transportation and planning components of each segment of the feasible alignments, and to provide the results of this analysis to the Evaluation Team for the purpose of synthesizing the analysis for use by UTDC in selecting a recommended shortlist of the most promising alignment alternatives.

Approach

Analysis of the transportation and planning components of the feasible alignments, and presentation of the results to Evaluation Team. Assumptions were made on:

1. guideway would fit beside T.H.&B tracks
2. guideway would not be constructed over a major utility
3. evaluation of each option will be influenced by the construction of the guideway
4. the location of the Terminal Station
5. stations within high residential populations
6. location of maintenance yard
7. location of commuter parking areas
8. new stadium will be developed
9. the minimum desirable radius is 35 m (115 ft.) with a maximum column spacing of 22 m (72.5 ft.)
10. Columns would be located at the beginning and end of curves
11. the guideway could be cantilevered to either side and consecutive columns could be cantilevered on opposite sides

12. double guideways were considered in CBD-1, CBD-2 and CBD-3 to illustrate the worst condition. Single guideways are assumed in CBD-4 loop
13. the width of the double guideway is assumed to be 6.6 m (22 ft.) and the width of a single guideway is 3.6 m (12 ft.)
14. columns and bents are located in a manner that would minimize the road impacts
15. in some locations, a trade-off can be made on road or pedestrian impact
16. generally, street capacity would have priority over pedestrian impacts
17. exact station location was not considered in this analysis
18. integration with surface transit buses was not considered
19. minimum clearance between guideway and a building is 4 feet

Recommendation — The preferred segments were recommended for consideration by the Evaluation Team.

Detailing of Shortlisted Alternatives: Planning

1981 - Marshall Macklin Monaghan Limited/Hatch Associates

Purpose — To analyze in greater detail the transportation and planning components of the four shortlisted alternative alignments and provide the results of this analysis to the Evaluation Team for the purpose of synthesizing the analysis for use by UTDC in selecting a recommended alignment.

URBAN DOCUMENTATION CENTRE
RESEARCH UNIT FOR URBAN STUDIES
McMASTER UNIVERSITY
HAMILTON, ONTARIO

Recommendation No recommendation.

Volume I - Technical Document
Volume II - Alignment Plans and Transportation Plans
Volume III - Land Use Plans, Urban Design Plans
Volume IV - HSR Bus Survey and DATA Analysis
Volume V - Sub-option Analysis

Hamilton Street Railway Transit Survey

1981 - Marshall Macklin Monaghan Limited/Hatch Associates

Purpose To document the study procedure and analysis of the Origin-Destination Transit Survey undertaken on HSR Mountain bus routes in December of 1981.

Approach A three part survey was carried out. An onboard questionnaire survey was distributed to passengers while boarding their bus. A count of boarding and departing passengers was made at each bus stop. Traffic flow, vehicle occupancy and vehicle classification counts were made on all Hamilton Mountain Access Routes for the purpose of identifying the p.m. peak traffic period and to determine traffic volumes as well as the transit model split during that time.

Recommendation No recommendation.

Comparison of Alternative Modes

1981 - Marshall Macklin Monaghan Limited/Hatch Associates

Purpose	To demonstrate the ability of the ICTS technology to comply with the Hamilton-Wentworth Rapid Transit System requirements and to compare the performance characteristics of ICTS with those of other proven and available transit modes.

Recommendation

Social Impact Study

1981 - Marketing Decision Research

Purpose	To assess the social impact of the implementation of rapid transit upon the Region and, specifically, along the selected route corridor.

Recommendation

Final Impact Study

1981 - IBI Group

Purpose	To assess the financial impact upon the Region of implementing rapid transit.

Recommendation

ENVIRONMENTAL

Existing Corridor: Natural Environment

1980 - Marshall Macklin Monaghan Limited/Hatch Associates

Purpose	To prepare a description of the natural environmental conditions in the ICTS Study Corridor.
Approach	Using existing information, the environmental conditions and associated impacts were described for the route alignment alternatives. In addition to documenting the natural environment of various alignment alternatives, this report discusses to the full extent of the available data base, the potential environmental impacts associated with the proposed undertaking. Any special physical or biological feature considered unique to a particular alignment, or group of alignments is highlighted.
Recommendation	No recommendation.

Description of Impacts on the Natural Environment along Alignments W, X, Y and Z

1981 - Marshall Macklin Monaghan Limited/Hatch Associates

Purpose	To analyze in greater detail, the potential changes to the natural environment for each of the set of four shortlisted alternative alignments and to provide the results of this analysis to the Evaluation Team for the purpose of synthesizing the analysis for use by UTDC in selecting a recommended alignment.

Approach

The four route alignments selected by Metro Canada Limited were each segmentized for more detailed study in order to provide a more comprehensive information base concerning the location, type and magnitude of impacts, as well as possible mitigative requirements. This approach was also used to define discernible differences between alignments, to assist in the selection of a preferred alignment.

Recommendation

No recommendation.

Description of the Natural Environment Along the Route Alignment Alternatives

1981 - Marshall Macklin Monaghan Limited/Hatch Associates

Purpose

To analyze biophysical impacts of constructing ICTS on each segment of the feasible alignments and to provide the results of this analysis to the Evaluation Team for the purpose of synthesizing the analysis for use by UTDC in selecting a recommended shortlist of the most promising alignment alternatives.

Approach

Based on the initial planning, engineering and environmental reports, further consideration was given to a description of the natural environment and the impacts of the proposed undertaking for the 26 route alignments chosen, using existing information.

Recommendation

Relative impacts were identified for each segment.

Ambient Noise Survey: Environmental Team

1981 - Marshall Macklin Monaghan Limited/Hatch Associates

Purpose	The report describes three distinct aspects of the environment into which the noise from the system is to be introduced. These are the human response to noise, the legal framework of the process whereby the impact of noise on the community will be assessed and description of a measurement programme undertaken to characterize the acoustical environment in those areas most likely to be affected by noise from the system.
Approach	Using existing information, the terms used to define noise are explained as well as a description of how noise is measured. The effects of noise on people and the legal framework for assessing this are discussed. During a field study, two types of noise measurement programs were set up, one being overnight measurements and the other being one half hour short term measurement.
Recommendation	Only obeservations and measurements were taken.

Noise and Vibration Impact Study along Recommended Route

1981 - Wilson Ihrig Incorporated

Purpose	To analyze the existing noise and vibration levels along the recommended route, to assess the impact the rapid transit system has when constructed with suggested mitigative measures where required.

Recommendation

PUBLIC PARTICIPATION

Analysis of Public Comments: Initial Open House

1980 - Connors Development Services

Purpose	To analyze the public's initial reaction to the concept of elevated rapid transit for Hamilton-Wentworth, following a coupon survey and Open House in October 1980.
Recommendation	No recommendation.

Analysis of Public Comments and Ranking of Evaluation Factors

1981 - Connors Development Services

Purpose	To assist the Evaluation Team, the analysis of Open Houses held in January 1981 were documented on the public's reponse to the evaluation criteria, route preferences and overall project support.
Recommendation	The public's response stressed good service, preservation of the Escarpment and impact on traffic movement.

Analysis of Public Comments on Selected Alignments

1981 - Connors Development Services

Purpose	To document the analysis of the public's comments on the Selected Alignments from coupon circulation and Open House comments during March of 1981.

Recommendation The public's preference was for Route "W".

Analysis of Public Ranking of Selected Alignments

1981 - Connors Development Services

Purpose To document the public's preference toward the selected alignments following their review of the "Summary of Findings" report and information.

Recommendation The public's preference was for Route "W".

Summary of Public Participation Program

1981 - Beak Consultants

Purpose To assess the public participation program and summarize the findings.

Recommendation

EVALUATION

Goals and Objectives for the Rapid Transit System

1980 - M.M. Dillon Limited

Purpose To prepare a summary of system objectives for the Hamilton-Wentworth Rapid Transit System as the basis for alignment and system evaluation.

Recommendation No recommendation.

Evaluation Framework and Preliminary Criteria

1980 - M.M. Dillon Limited

Purpose To prepare a report on the evaluation framework and preliminary criteria to be used in the initial and future evaluation of route alignment alternatives.

Approach Refinement of the evaluation methods to be used in shortlisting alternatives. Documentation of the process by which the criteria for the comparative analysis of feasible alignments were selected from the preliminary list contained in the Evaluation Framework and Preliminary Criteria Report.

Recommendation No recommendation.

Evaluation Methods and Criteria for Shortlisting Alignments

1981 - M.M. Dillon Limited

Purpose To confirm the evaluation method and criteria for use in shortlisting the alignment segment alternatives to four distinct rapid transit routes.

Recommendation No recommendation.

Recommended Alignments and Summary Evaluation

1981 - Metro Canada Limited

Purpose To document the comparison of alternative alignment segments and recommend four rapid transit routes.

Recommendation	Following an intensive and extensive evaluation process, Routes W, X, Y and Z with a number of sub-options, were recommended for further detailed analysis and evaluation.

Evaluation Methods and Criteria for Recommended Alignment Selection

1981 - M.M. Dillion Limited

Purpose	To prepare a document on the evaluation method and criteria for use in selecting a recommended alignment from the shortlist of four alternatives, including the sub-options.
Recommendation	No recommendation.

Rapid Transit Study Route Choices: Summary of Findings

1981 - Metro Canada Limited

Purpose	To provide a summary document of the engineering, planning and environmental analysis of the four shortlisted alignments.
Recommendation	No recommendation.

Summary Evaluation of Rapid Transit Routes and Recommendation of Preferred Route

1981 - Metro Canada Limited

Purpose	To document the comparison of the four alignments to select a preferred alignment.
Recommendation	No recommendation.

APPENDIX 3

ROUTE CHARACTERISTICS OF ALTERNATIVES W, X, Y AND Z(40)

	W	X	Y	Z
NATURAL ENVIRONMENT				
• Mature trees removed (mainly lower city impact)	60	40	30	30
• Replaceable trees removed	50	85	90	70
• Significance of tree	larger native species at and immediately below escarpment	larger native species along St. Joseph's Rd.	Minor	Minor
• Replanting capability of area	Good around portal at escarpment	On mountain replanting must occur on private property along alignment due to loss of boulevard. In lower city, replanting is possible.		
CONSTRUCTION				
• Transportation Impacts				
• Diversions	Some traffic diverted to Up. Wellington St.	Some traffic diverted to Up. James St. & Up. Wentworth St.		
• Mountain	Up. James - centre-lane is already built and can be used	Up. Wellington - close down 2 centre lanes/traffic disruption (1400 - 1600 veh/hr)		
	Cut & cover closes two lanes north of Fennell Ave. (2000veh/hr.)	Jolley Cut - close two lanes		
• Lower City	Minor impacts to lower city	Impact when John St. realigned	TH & B/CNR will require special provisions Minor impacts to lower city	Minor impacts to lower city
• Pedestrian Flow	--Major pedestrian disruption is in CBD where common route exists----------------			
• Homes-construction disruption to total units	503	671	363	366 plus First Plac units
• Business construction disruption relative to total units	Up. James north of Fennell. Major impact dependent upon duration of road disruption	---Upper Wellington St. Business area impacted----------- John St. businesses are impacted	TH &B/CNR will require special provisions	0
Loss of on-site parking	Temporary loss of parking at Mt. Plazas	0	0	0
• Environmental	Temporary impacts on Escarpment face	Minor impacts to St. Joseph's R.O.W.	Minimal impacts	Minimal impacts
• Sensitive Uses	Some impact at St. Joseph's Hospital, but distance & activity at that area of hospital will minimize impact	Strong impact on medical activities along John St. corridor at St. Joseph's Hospital	0	0
COSTS:				
Capital	$111.1* M.	$113.4 M.	$117.2 M.	$125.2 M.
Operating	$3.4 M.	$3.3 M.	$3.3 M.	$3.4 M.
STAGING:				
• Temporary Terminus	Good terminus location due to availability of open space if parking garage required.	Terminal location may require removal/rebuild of Safeway to provide parking area. Dependent upon anticipated park 'n' ride trade.		
• Future Costs to Mall	$32.2 M.	$17.9 M.	$17.9 M.	$17.9 M.
• Future connections	Expansion occurs from loop	Expansion occurs from loop	Expansion occurs from loop	Good connection potential to North and East from King/Wellington area plus expansion from loop capability to west

	W	X	Y	Z
PROXIMITY TO USES: (cont'd)				
Public Uses				
• Open Space	James St. stairs adjacent to alignment	0	0	0
• Overshadowing	15 homes/midwinter have temporary shadow impacts	85 homes midwinter have temporary shadow impacts. Commercial corridor from Brucedale to Queensdale is darkened due to guideway and proximity of buildings		
• Sensitivity of Uses	St. Charles Church	St. Joseph's Hospital St. Elizabeth Nursing Home Church of the Ascension	0	0
• Hist/Arch Significance	Augusta/Hughson	Church of the Ascension	0	0
Number of Dwelling Units & Sensitive Uses Close to Stations				
• Increase in activity due to buses (impact adj. homes)	Mountain is Commercial areas mainly. Lower city is not a major bus transfer point (0)	Area around stations is mainly residential on mountain. Lower city is not a major bus transfer point (approx. 30)	Area around stations both above & below mountain is mainly residential(approx. 30)	Area around stations c mountain is mainly residential,lower city is mainly commercial (approx. 30)
Impact on Local Streets				
• Use by buses	--------------Collector & Arterial Roads are used------------------------------			
• Parking at stations	some parking may occur on plazas if not provided for in station design especially at terminal	some parking may occur on sidestreet and regulatory signs may have to be posted.		
Integration with Streets				
• right of way widths	100' Up. James, 66' James, Hughson, Charlton	66' Up. Well., John, St. Joseph's (varies)	66' Up. Wellington & TH 8B R.O.W.	66' Up. Wellington 66' Wellington 66-40' King William
• building face to building face (minimum)	150', 210', 115'	120', 65', 140', 60'	120', 65', 100'	120', 65', 125', 75' 6
• potential for future change in land uses along alignment to help integration	Good potential along Upper James St. corridor & Hughson St. corridor	Some potential along Upper Wellington St. north of Fennell Ave. Poor potential south of Fennell Ave. Some potential along John St.	Some potential along Upper Wellington St. north of Fennell Ave.; poor potential south of Fennell Ave. Little potential along TH 8B	Some potential along Upper Wellington St. north of Fennell Ave. poor potential south of Fennell Ave. Good potential along CHARM, Wellington St. & King William.
OBSTRUCTION OF VIEWS				
• views of escarpment	At entrance to tunnel	enters escarpment in major transportation area where structures now exist		
• views along corridors	James St. corridor has minor impact	John Street corridor has strong impact	----	----
• views of cultural/hist. uses	Hughson/Augusta area	John/Charlton area	----	----
• views from public areas	St. Joseph's Hospital	----	----	----
• length of view disrupted	Views can occur below guideway and between columns, blockage will be an individuals perception.			
DEVELOPMENT/REDEVELOPMENT AT STATIONS				
• Official Plan Goals	----	----	----	King/Wellington as growth node
• Zone	On Mountain, zoned commercial - some pot. for change. Limited opportunity at St. Joseph's area due to character of neighbourhood	Stable residential on Mt. Good opportunity at Inverness. Limited opportunity at St. Joseph's area due to existing development.	Stable residential on Mt. Good opportunity at Inverness. Limited opportunity at Young St. due to TH8B	Stable residential on Mt. Good Opportunity at Inverness. Good opportunity at King/Wellington due to growth node desire
• Community Impact if redevelopment occurs where opportunities are good.	Low impact	Some impact	Some impact	Some impact
• Land availability for development	Little land available	Little land available	Land available along TH 8B	Good land availability at King/Wellington

	W	X	Y	Z
PEDESTRIAN INTERFACE:				
Movements				
• sidewalk narrowing	No sidewalks need be removed	-----Commercial activity on Upper Wellington will be---------- impacted due to sidewalk narrowing between Queensdale/ Brucedale		
PROPERTY ACCESS:				
Residential				
• Left turns restricted at homes/apartment units	42 houses/62 apt. units(104)	148 houses/30 apt. units(178)	148 houses/30 apt. units (178)	148 houses/30 apt. units (178)
Commercial				
• Left turns restricted	(Up. James: South-bend Richwill) 6 commercial units	---(Upper Wellington: Brucedale to Queensdale)--- 49 commercial units	49 commercial units	49 commercial units
• Importance of Access	Important (Hwy. Comm)	---Mainly Neighbourhood Comm. use + Municipal Parking Lots-------- on both sides of street		
Public				
• Emergency uses impacted by access restrictions	0	0	0	0
PARKING:				
• On street removed	9	0	0	0
• Business Impact	Professional Offices	0	0	0
• Alternate Parking Available	Yes, in adjacent parking lots	0	0	0
DISPLACED USES:				
Housing				
• Apartment Units	0	3 units at Inverness Station	3 units at Inverness Station	3 units at Inverness Station + 15 rooming house units at Main/Wellington
• Single Family (depend on owner option)	0	5 - John St. Station 1 - Mohawk Station	1 - Mohawk Station	1 - Mohawk Station
Commercial				
• Business Units	1	14	14	15
• Off Street Parking	380 spaces at Mountain Plazas	----	----	Some off street parking space areas along King William and Wellington for column placement. Minor impact
• Railway			Dependent upon R.O.W. uses from THAB & CNR	
Public Uses				
• Buildings	0	Onteora School	Onteora School	Onteora School
• Open Space	Niagara Escarpment at tunnel portal, St. Joseph's Hospital parkette	Parkette at Fennell Ave.	Parkette at Fennell Ave.	Parkette at Fennell Ave.
• Potential for Replacement	stairs can be relocated	-- Parkette can be redesigned into station. ---		
• Historical Buildings	0	0	0	0
PROXIMITY TO USES:				
Residential				
• Total Houses along Alignment	53	161	166	169
• Total houses at Portal	12	7	7	7
Dwelling Units				
• Potential for Privacy Impact (1½ - 3 storey units at 100')	57	168 (includes 64 medical beds)	72	94
Office and Commercial Frontage				
• Potential for Privacy Impact (2nd/3rd storey at 100')	4050'	3810'	3890'	4450'

	W	X	Y	Z
TRANSPORTATION: TRAVEL TIME MacNab St. Station to Mohawk Station	8 min/31 sec minimum	6 min/38 sec minimum	6 min/50 sec minimum	8 min/15 sec minimum
Rapid Transit Ridership: 1986/2001 Yearly	8,250,000/18,879,000	8,487,000/20,106,000	8,400,000/19,566,000	8,250,000/19,881,000
Potential to Attract More Riders				
1) Population around stations to reflect walk-in potential differences	3,900	5,600	5,700	6,100
2) Major Activity Centres served	St. Joseph's Hosp.	St. Joseph's Hosp.		
3) Redevelopment Potential to increase rapid transit usage	2 mountain stations	At Inverness Sta.	At Inverness Station At lower city station	At Inverness station At lower city station
4) Major office employment at lower city station	380	0	0	112
Ancillary Facilities:				
• bus loops	(where required,) bus loops can be provided at all station sites			
• kiss 'n' ride	can be provided at all -- kiss'n' ride problems at Wellington/Mohawk station -- sites			
• emergency & maintenance road	yes (James Mt. Rd. to portal)	YES (St. Joe's R.O.W.) CHARM TO PORTAL	YES (along TH&B) CHARM TO PORTAL	YES (CHARM to Portal)
• site layout difficulties for maintenance yard	SOME (Have to cross maintenance yards)	SOME (Have to cross maintenance yards)	NO (Parallels maintenance yards)	NO (Parallels maintenanc
SURFACE TRANSIT INTERFACE:				
Passenger Convenience				
• non-CBD connections	Service to St. Joe's plus James St. corridor. Industrial Express from CBD	Service to St. Joe's. Industrial Express from CBD	Industrial express connection at Young St. saves 2 minutes more than Wx.	5 min less travel time for east lower city to mountain transfers (50% of all bus transfers). Excellent opportunity for industrial express services; saves 5 min.
• extra travel time	Transit riders are now oriented toward the East Mountain at a 2:1 ratio. Therefore, closer rapid transit is to east mountain, better service is provided. Estimated 2 minute extra travel time as compared to X,Y,Z	Transit users to west must be re-routed one major block (2 Min.) out of way (Downtown). This now occurs due to bus orientation.		
Bus System				
• feeder bus miles	18996 mi.	18456 mi.	18456 mi.	18456 mi.
• service area	Immediate benefit to 5,000 people to S.W.	Long range benefit to new population of 30,000 planned to Southeast (travel time saving)		
• bus miles on escarpment	Concession St. to CBD bus route must remain	All buses removed from escarpment	Inverness station to St. Joe's bus route must be put in service	Inverness station to St. Joe's bus route must be put in service
• express service option	Good potential to Mohawk College. CBD to industrial area	Some potential to Mohawk College. CBD to industrial area	Some potential to Mohawk College. Young to industrial provides good opportunities	Good to Mohawk College due to transfer movement. Wellington to Industrial provides excellent opportunities
ROAD INTERFACE:				
Capacity				
• Length of Pavement narrowed	No significant reduction in road traffic envisioned. Where rapid transit intrudes on roadway, traffic lane are reconstructed to satisfy road needs			
Side Street Access				
• Restrictions	right turns only at Southbend/Upper James	-----Right turns only at Morris, Dean, McElroy, Brucedale-------		
• Number of Homes Impacted	28	331	331	331

APPENDIX 4

POTENTIAL IMPACTS OF ICTS
TO
ROADS AND TRAFFIC
ALONG
THE PROPOSED ICTS ALIGNMENT(42)

Segment: Upper James Street

- Richwill Road to McElroy Road
    - R.O.W. 100'
    - Pavement - 62'
    - E/S and W/S
        - 5' boulevard
        - 5' CW
        - 8.6' CW to PL
    - pavement widens south of McElroy Road

- McElroy Road to Wembley Road
    - R.O.W. 103.5'
    - pavement 74'
    - E/S 7' CWC
    - W/S
        - 5' boulevard
        - 5' CW
        - 11' CW to PL

- Guideway Location
    - guideway will be located in a centre median

- Impact
    - left turns at driveways on Upper James from Richwill Drive to just north of McElroy will be restricted
    - left turns from Upper James to Richwill Drive would be permitted. Right and left turns from Richwill Drive to Upper James will be permitted
    - left turns from Upper James to South Bend Road would be prohibited
    - turns from South Bend Road to Upper James would be restricted to right turns only
    - road capacity and existing number of lanes would be retained within the existing curb to curb width
    - left turns at McElroy will have to occur with a separate phase built into the traffic signal

- Lower City Segments

Segment: James Street

- at Markland Street
  - 66' R.O.W.
  - pavement 39'3"
  - 5'5" boulevard E/S
  - 8'5" CW E/S (1)
  - 5'5" CWC W/S (2)
  - columns to be placed in east boulevard
- St. Joseph's Drive to Herkimer Street
  - 66' R.O.W.
  - 39'9" pavement
  - 4'4" boulevard E/S
  - 7'9" CW E/S
  - 5'5" CW W/S
- Guideway Location
  - the guideway will be placed in the east boulevard angling across to the intersection of Charlton Street and Hughson Street
- Impact
  - the road capacity will be retained

Segment: Hughson Street

- Charlton to Forest
  - 66' R.O.W.
  - 30' pavement
  - 5'6" CWC W/S
  - 5'6" CWC E/S

- Forest Street to Young Street
  - 66' R.O.W.
  - 30' pavement
  - 5'6" CWC E/S and W/S
- Young to Augusta
  - 66' R.O.W.
  - 30' pavement
  - 5'6" CSC E/S and W/S
- Augusta to Haymarket
  - 39' R.O.W.
  - 24' pavement
  - 7' CWC E/S and W/S

- Guideway Location
  - the guideway columns between Charlton and Augusta will be placed in the pavement along the west curb
  - the guideway will angle east at Augusta and then north to the T.H.&B. through the parking areas as shown on Plan 8130-HA-104

- Impact
  - the roadway would be changed to two 11 foot lanes and an 8 foot parking lane between columns. This would necessitate the shifting of the on-street parking from the east side to the west side of the street between Charlton and Young. Parking would be permitted between columns, however, a reduction in the number of parking spaces from 14 to 9 would result

- The permissible column spacing would ensure access to all intersecting roads, although visibility may be limited at intersections for cross-street traffic. This would not create serious problems since there are now stop signs on Hughson Street at each intersection except at Forest where the existing stop control would be reversed.

The placement of the guideway along the west curb would mean that all on-street parking would be located on the west side between the columns. Because of the column spacing and consideration of existing driveways, the number of parking spaces would be reduced as shown in Table 1.

Table 1

On-Street Parking

Hughson Street		Present	With ICTS
Charlton to Forest	E/S	6 spaces	4
Forest to Young	E/S	8 spaces	5
Young to Augusta	W/S	8 spaces	6
Augusta to Haymarket	E/S	5 spaces	3
	Total:	27 spaces	18 spaces

Presently, there are 5 parking spaces on the east side of the street between Young Street and Augusta Street and 5 spaces between Augusta Street and Beckley Street. These spaces will be relocated to the west side between the guideway column.

- CBD Loop Segments

  Segment: T.H.&B. R.O.W.

  - MacNab Street to Catharine

- Guideway Location
  - guideway will be placed within the T.H.&B. R.O.W. as shown on Plan 8130-HA-104
- Impact
  - the guideway would have no impact on adjacent roadways

Segment: Catharine Street

- ° Hunter to Main
  - 40' R.O.W.
  - 20-24' Pavement, one way S/B
  - 5'-6' CW E/S and W/S
  - columns to be placed on the west side along the property line
- ° Main to King
  - 39'9" R.O.W.
  - Pavement 29'9" to 33'8", one way S/B
  - 5' CWC W/S
- Guideway Location
  - guideway and columns would be placed on W/S on property outside the existing road allowance
- Impact
  - the existing number of lanes and road capacity will be retained

Segment: Catharine Street

- King Street to King William Street
  - 45' R.O.W.
  - 30' Pavement, one way S/B
  - 8' CW W/S
  - 6.5' CW E/S

- Guideway Location
  - the guideway will turn from the west side of the roadway to the east to permit the turn west onto King William Street

- Impact
  - cantilevers will be used to support the guideway with no reduction in pavement width

Segment: King William Street

- Catharine Street to John Street
  - 48' R.O.W.
  - CW 10' N/S and S/S
  - 28' Pavement, one way E/B, 2 lanes

- John Street to James Street
  - 48' R.O.W.
  - 30' Pavement, one way E/B, 2 lanes
  - 8'-10' CW N/S and S/S

- Guideway Location

  - the guideway is to be located along the north side of the roadway between Catharine Street and John Street to facilitate a planned station. Between John Street and James Street, the guideway will be located on the south side of the roadway 18 ft. north of the south property line

- Impact

  - the pavement will be reduced but two traffic lanes will be maintained
  - the on-street parking presently along the north side of the street cannot be moved between the columns on the south side because of the numerous driveways on the south side, and hence most on-street parking would be eliminated
  - visibility at intersecting streets would be affected. However, where traffic signals are installed, the problem caused by this visibility constraint is removed. At Hughson Street, where traffic signals do not now exist, a reversal of the stop condition (stop sign) to King William Street from Hughson Street should resolve the visibility problem.

Segment: James Street

° King William Street to King Street

  - 80' R.O.W.
  - 53' Pavement, one way S/B
  - 12' CW E/S and W/S

- Guideway Location

  - the guideway would be located in the west sidewalk 11 feet east of the west property line

- Impact

    - the number of lanes and road capacity will normally be retained, however, to negotiate the turn at King William onto James, the sidewalk will be narrowed due to column placement.

Segment: King Street

° James Street to MacNab Street

    - 57' Pavement, one way W/B
    - 12'6" CWC N/S and S/S

- Guideway Location

    - the guideway would be located over the north sidewalk between James Street and MacNab Street, 11 feet south of the north property line

- Impact

    - the pavement width and number of lanes would be retained
    - visibility would not be affected since the intersections are presently signalized

Segment: MacNab Street

° King Street to Main Street

    - 24' roadway E/S and W/S of centre bus island
    - 17.75' median bus island

- Guideway Location

    - guideway columns would be located in a widened median. The widening would occur to the west.

- Impact
  - one of the three northbound traffic lanes would be eliminated
  - the southbound lanes could be restricted to buses only to provide suitable interface between the ICTS station and the surface buses without interference from vehicles

Segment: Whitehern Loop

° Main Street to T.H.&B.

- Guideway Location
  - placed outside of R.O.W. around Whitehern Place to T.H.&B.
- Impact
  - the road capacity and the number of lanes on the adjacent streets would be retained

i) Road Capacity

° In general, the alignment follows the road allowance of major roads and has been located to maintain the existing number of basic lanes.

° There will be some pavement narrowing on sections of Hughson and King William where only parking will be affected.

° Other than the effect of guideway columns on MacNab Street, there will be little or no impact on arterial road capacity.

ii) Left Turn Prohibitions

- Left turn restrictions will only occur along a three block section of Upper James Street where a centre median will be created

    - left turns from the arterial road can occur only where a left turn lane is provided in the 20 foot median. This can be done with cantilevered guideway columns.
    - left turns onto the arterial road can be permitted only where traffic control signals are installed.
    - left turns will be restricted from driveways.
    - right turns will only be permitted at Southbend Road.

iii) Traffic Control

- Reduced visibility due to guideway location will have an impact at two minor intersections in the downtown area where the reversal of stop sign control will be necessary. This includes Charlton at Forest and Hughson at King William. Additional locations may be identified at the detailed design stage.

iv) Parking

- The parking supply will be reduced by nine spaces on Hughson Street on the W alignment.

- Most of the parking spaces on King William Street between James and John will be eliminated.

v) Boulevard Width

- Boulevard width will remain equal to or greater than existing in most locations.

APPENDIX 5

CONSTRUCTION IMPACTS
ON
EXISTING SERVICES AND UTILITIES(43)

APPENDIX

IMPACTS ON EXISTING SERVICES AND UTILITIES

Street	Road Reconstruction, Utility and Service Relocations	Major Disruptions due to Utility and Service Relocations
- Station at Upper James	° Bury hydro cables on Mohawk Road ° Relocate hydro ducts on Upper James ° Relocate 2 hydro poles on Upper James ° Relocate street lights ° Relocate 8" dia. gasmain ° Restoration	Short but significant disruptions to hydro and gas services
UPPER JAMES STREET		
- Richwill Road to South Portal FIG. 3.54	° Relocate hydro ducts and 8" dia. gas main ° Temporary works and restoration	Short but possibly significant interruption to gas and hydro services

Street	Road Reconstruction, Utility and Service Relocations	Major Disruptions due to Utility and Service Relocations
- Portal and Station at Fennell Avenue	° Move access to Mall parking lot south to avoid conflict with Portal	
	° Relocate 36" dia. and 12" dia. watermains	Access to Fire Hall and gas station restricted during sewer and watermain construction
	° Relocate hydro poles	
	° Construct new 12" dia. sewer	
	° Remove and reinstate portions of Upper James Street and Fennell Avenue	
	° Temporary works and restoration	
JAMES STREET SOUTH		
- North Portal	° Replace 700 ft. of 4'x4' box sewer with 60" dia. pipe	
	° Reconstruct stairway up escarpment	
	° Restoration	
- St. James Place to Charlton Avenue including Station	° Restoration	

Street	Road Reconstruction, Utility and Service Relocations	Major Disruptions due to Utility and Service Relocations
HUGHSON STREET		
- Charlton Avenue to Augusta Street FIG. 3.55	° Relocate Bell Telephone ducts ° Relocate street lights ° Relocate 4" dia. gasmain ° Relocate hydro poles to east side ° Restoration	
- Augusta Street to Haymarket Street	° Restoration	
TH&B RAILWAY		
- Hughson Street to Catharine Street	° Restoration	

Street	Road Reconstruction, Utility and Service Relocations	Major Disruptions due to Utility and Service Relocations
CATHARINE STREET		
- T.H. & B. Railway to King Street	° Relocate Bell ducts on Hunter Street ° Relocate hydro ducts on Hunter Street and King Street ° Dismantle and re-erect trolley bus cables on King Street and Main Street ° Restoration	Short but significant interruptions to Bell service Cannon trolley buses must be short-turned at Wellington during construction of guideway across King Street
- King Street to King William Street	° Relocate 24" dia. watermain ° Relocate 8" dia. gasmain ° Relocate hydro ducts on King William Street ° Restoration	Traffic will be restricted to one lane during watermain and gasmain relocation Short but possibly significant disruptions to hydro and gas service
KING WILLIAM STREET		
- Catharine Street to John Street	° Relocate hydro and street light duct banks ° Relocate street lights ° Restoration	Duct banks - major power supply to downtown area. Relocation may result in significant disruptions to service during relocation

Street	Road Reconstruction, Utility and Service Relocations	Major Disruptions due to Utility and Service Relocations
- John Street to James Street FIG. 3.56	° Relocate 6" dia. watermain	Traffic will be restricted to one lane during utility relocations
	° Relocate 8" dia. L.P. gasmain	
	° Relocate Bell duct	
	° Dismantle and re-erect trolley bus cables on Hughson Street	Barton trolley buses must be short-turned at Robert Street during guideway construction across Hughson Street
	° Restoration	
JAMES STREET		
- King William Street to King Street	° Dismantle and re-erect trolley bus lines on James Street	Barton trolley buses must short-turn at Robert Street during guideway construction
	° Relocate street lights	
	° Relocate Bell and hydro ducts	Short but significant disruptions to Bell service
	° Relocate traffic lights at King Street and King William Street	
	° Temporary works and restoration	

Street	Road Reconstruction, Utility and Service Relocations	Major Disruptions due to Utility and Service Relocations
KING STREET		
- James Street to MacNab Street FIG. 3.57	° Relocate street lights	
	° Relocate traffic signals at MacNab Street intersection	
	° Relocate trolley bus cables on King Street	Trolley buses on King Street must short-turn during construction
	° Relocate hydro and Bell ducts	
	° Relocate hydro manhole	Short but significant disruptions to hydro and Bell supply to Downtown businesses
	° Restoration	
MACNAB STREET		
- King Street to Main Street FIG. 3.58	° Relocate 6" dia. watermain	
	° Relocate 4" dia. gasmains at King Street and Main Street	
	° Relocate traffic signals at Main Street and King Street	
	° Relocate trolley bus cables on MacNab Street	Trolley buses on MacNab Street and Main Street will be short-turned during construction
	° Relocate street lights	
	° Temporary works and restoration	

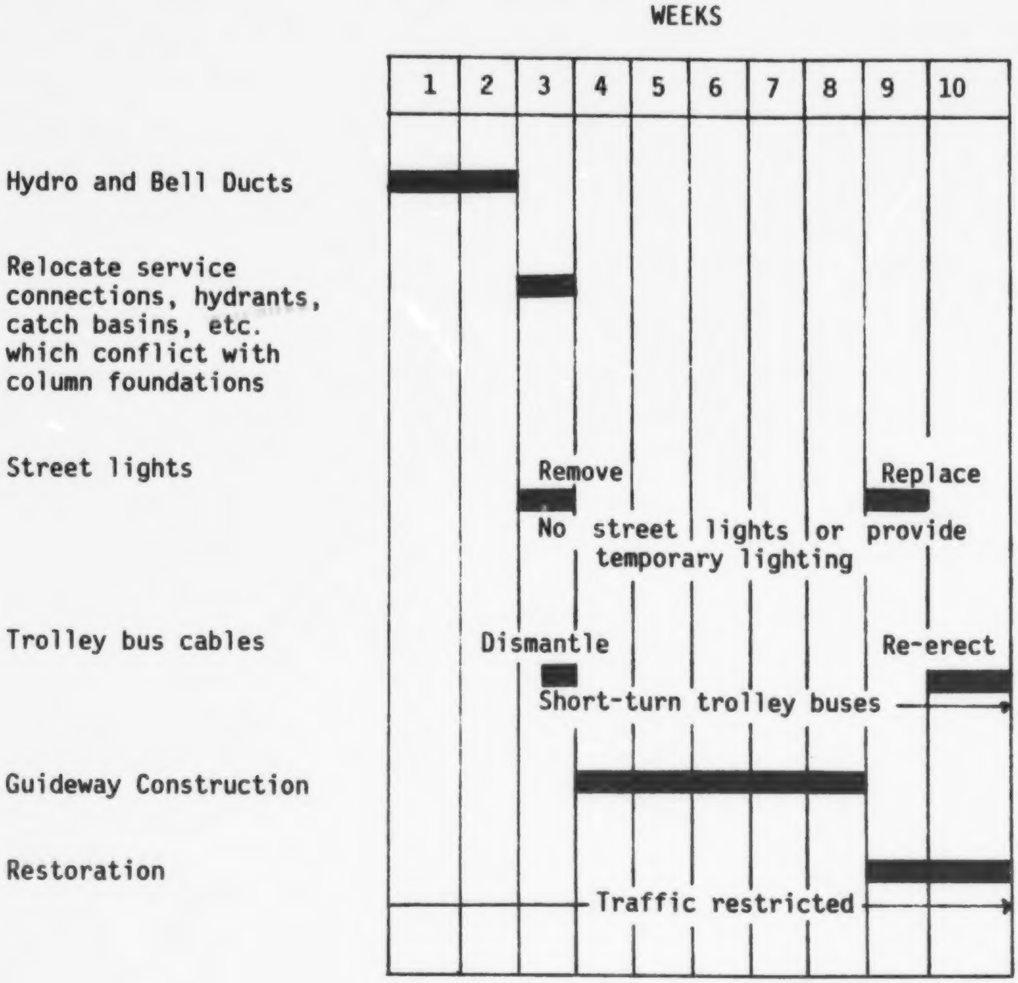
Street	Road Reconstruction, Utility and Service Relocations	Major Disruptions due to Utility and Service Relocations
- Main Street to Jackson Street	° Relocate Bell duct ° Relocate street lights ° Restoration	
CITY HALL PARKING LOT		
- Jackson Street to T.H. & B. Railway	° Restoration	
TH&B RAILWAY		
- MacNab Street to Hughson Street	° Relocate signal cable and drainage where necessary ° Restoration	

In order to keep interruptions to service to a minimum, most service and utility relocations and road widenings will be carried out prior to guideway construction. The length of time required to carry out these works will depend largely on co-ordination. If all relocations and road works were to be carried out by one general contractor, work on the various service utilities could be carried out concurrently. However, if the agencies controlling them wish to carry out the work using their own forces or contract out the works themselves, then the time required to complete all relocations will be lengthened considerably. Disruptions to traffic and access will similarly be increased, as will restoration costs due to duplication.

Where extensive road works and relocations are required, considerable lead time will be required. This work would have to be completed prior to guideway construction to avoid restricting traffic too severely.

The chart on the following page is an example of how relocations could be scheduled for one section of guideway approximately 400 ft. in length, in this case on King Street from James Street to MacNab Street. Relocation work would follow a similar pattern for other sections of guideway.

KING STREET - James Street to MacNab Street



APPENDIX 6

CONSTRUCTION IMPACTS - TRANSPORTATION FACTORS(44)

IMPACTS OF CONSTRUCTION - TRANSPORTATION FACTORS

The construction impacts will be discussed related to the following transportation factors:

- Road System
- Surface Transit
- Access to Adjacent Properties

Mountain Segments

Segment: Upper James Street - Richwill Road to Wembley Road

- A centre median would be constructed in the existing centre two way left turn lane. The guideway would be located in the median.

Impact:

° Road System

During construction of the median, the number of lanes in each direction would be affected and exclusive turning lanes at intersections may be eliminated for short periods of time. During the peak daily periods, it would be desirable to maintain two lanes to accommodate the traffic volumes. Otherwise, considerable congestion will occur with diversion to other routes. After the completion of the median, the impact of constructing the guideway would be less severe. The number of lanes would be maintained to accommodate the peak period traffic volumes.

° Surface Transit

Bus service would be retained on Upper James, however, construction may cause some congestion at times affecting the bus schedule.

- Access to Adjacent Properties

  Since construction would take place in the median, access to residences and businesses would be retained to the same extent as in the final condition.

Segment: Upper James - Fennell Avenue to Genesee Avenue

The cut and fill construction for the underground segment is detailed by the Engineering Team.

Impact:

- Road System

  It is likely that there would be periods when traffic would not be allowed on this segment of Upper James Street. Traffic would be diverted to either West 5th Street or Upper Wellington Street to the CBD or back to Upper James via Brucedale Avenue. This would result in out-of-way travel and the rerouting of trucks onto residential streets. This would not only contribute to road congestion but also impact on abutting properties from increased volumes of vehicular and truck traffic.

- Surface Transit

  The Upper James bus and the rush hour Upper James/Claremont bus both use this segment of Upper James. During the cut and cover construction, bus service would not be possible, however, both buses could be rerouted via Brucedale Avenue.

- Access to Adjacent Properties

  This section of Upper James is mainly commercial and hence, the closing of the street would have a severe impact on the businesses. Pedestrian traffic would, however, likely be permitted.

Lower Escarpment Segments

Segment: James Street - Tunnel Portal to Charlton Avenue

The guideway is to be located in the east boulevard.

Impact:

- Road System

  South of St. Joseph's Drive, the disruption to traffic would be minimal since the pavement width is adequate to accommodate the traffic volumes with a reduction of one northbound lane. There may be some congestion at peak times at the Markland intersection, which can be alleviated by shifting of a temporary centreline to provide a left turn lane.

  North of St. Joseph's Drive, the roadway would be reduced by one lane for column construction, however, the disruption would be for a short period of time only.

- Surface Transit

  All Mountain routes via the Jolley Cut use James Street. Column construction would have an impact on the schedules, however, no rerouting would be necessary.

- Access to Adjacent Properties

  Access to abutting properties would be maintained.

Segment: Hughson Street

- Charlton to Haymarket

The guideway is to be located in the west boulevard to Augusta and then turning east and then north to the TH&B R.O.W.

Impact:

- Road System

  The roadway would be reduced from three lanes to two lanes, however, parking is permitted on one side. During construction, the parking would be prohibited and traffic in both directions would be allowed. Hence, the impact would not be severe.

- Surface Transit

  None.

- Access to Adjacent Properties

  Access would be maintained during construction.

CBD Segments

Segment: TH&B R.O.W. - Whitehern to Catharine

The guideway would be located with the railway R.O.W. causing no disruption to roadways, surface transit or access to residences and businesses.

Segment: Catharine Street - TH&B to King William

Between the TH&B R.O.W. and King Street, the guideway would be located west of the roadway on private property. Between King Street and King William Street, the guideway swings from the west side to the east side of the roadway in order to negotiate the turn west on to King William Street.

Impact:

- Road System

  During construction, one lane of the roadway would be closed. This would create some congestion, however, traffic could easily be diverted to adjacent streets with no serious consequences.

- Surface Transit

  No impact on surface transit.

- Access to Adjacent Properties

  Access will be maintained during construction.

Segment: King William Street - Catharine Street to James Street

The guideway would be located on the north side of the street between Catharine and John and on the south side between John and James.

Impact:

- Road System

  The roadway would be reduced from three lanes to two during construction. Traffic movement would be permitted, however, the parking would be eliminated.

- Surface Transit

  No routes on King William.

- Access to Adjacent Properties

  Access to businesses along King William would be maintained.

Segment: James Street - King William to King

The guideway turns from the south side of King William to the west side of James Street. Disruption would occur due to the guideway crossing of James Street and column construction.

Impact:

- Road System

  Disruption would occur during guideway construction by the closure of one lane, however, only for a short period of time. To avoid serious congestion, traffic could be rerouted to nearby streets.

- Surface Transit

  Some disruption would occur to the service and scheduling of buses on James Street, however, the present routing should be maintained. There may be disruption to the trolley coach overhead wires. It may be necessary to short turn trolleys for a short time and provide diesel shuttle service in the CBD.

- Access to Adjacent Properties

  Access would be maintained.

Segment: King Street - James Street to MacNab Street

The guideway would be located over the north sidewalk and then turning south on to the median on MacNab Street.

Impact:

- Road System

  The north lane would be closed during the guideway construction creating some traffic congestion on King Street. Traffic could be rerouted onto nearby streets to reduce the congestion.

- Surface Transit

  Surface transit and trolley routes would be maintained on King Street, however, due to the reduced number of lanes, disruption to service and scheduling would occur. Trolley wires may be temporarily removed requiring short turning trolley routes.

- Access to Adjacent Properties

  Access would be maintained to abutting properties.

Segment: MacNab Street - King Street to Main Street

The guideway would be located over the existing median.

Impact:

- Road System

  The roadway would be reduced from two lanes to one lane in each direction. However, the volume of traffic is low and hence, the impact would not be severe. Diversion of traffic to nearby streets would be possible.

- Surface Transit

  During construction of the station and guideway, the trolley and diesel buses would be rerouted onto James Street between King and Main. Northbound buses could use MacNab and a temporary bus stop would be located on the north side of King Street west of MacNab.

- Access to Adjacent Properties

  Access would be maintained to serve adjacent properties.

Segment: Whitehern Loop - Main Street around Whitehern to the TH&B R.O.W.

The guideway would turn eastward, south of Main over the Football Hall of Fame, around the Whitehern property to the TH&B R.O.W.

Impact:

There would be little impact on roadways, surfact transit and access to adjacent properties.

APPENDIX 7

AIR QUALITY IMPACTS
AMBIENT DISPERSION ASSUMPTIONS(45)

AIR QUALITY IMPACTS
AMBIENT DISPERSION ASSUMPTIONS

This appendix outlines the ambient dispersion assumptions used to estimate the relative impacts on nearby residences resulting from the emissions from construction activities.

For a ground level release from a non-buoyant point source, the downwind centreline concentration is:

$$X = \frac{Q}{\pi \sigma_y \sigma_z u}$$

Where: X = ground level concentration (g/m^3)
Q = source strength (g/s)
π = 3.1416
σ_y = horizontal dispersion coefficient (m)
σ_z = vertical dispersion coefficient (m)
u = wind speed (m/s)

To determine relative ground level concentrations at a distance X downwind from the source, it has been assumed that:

- The area of construction activity is a circle with a diameter of 6 metres.
- The construction activity is a point source with an initial horizontal dispersion equal to the diameter of the construction activity.
- The vertical dispersion coefficient does not vary with X.
- At the construction site $X = 1$.

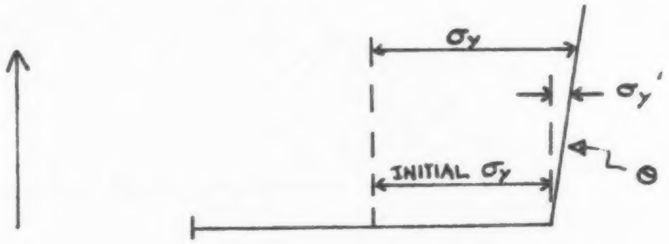
Because Q, π, σ_z and u are constant with X:

$$X = \frac{K}{\sigma_y}$$

Where: K = constant

σ_y = initial $\sigma_y + \sigma_y'$,

initial σ_y = 1/2 length of construction activity



Length of construction activity

Since at the source X = 1 and $\sigma_y' = 0$

$$I = \frac{K}{\text{initial } \sigma_y}$$

$$K = \text{initial } \sigma_y = \text{1/2 length of construction activity} = 3$$

And, at any distance X downwind:

$$X = \frac{3}{3 + \sigma_y}$$

To determine σ_y' use McElroy - Pooler dispersion coefficients (based on a series of experiments studying the dispersion of ground level releases in St. Louis).

For atmospheric stability, category 'D' (Pasquill):

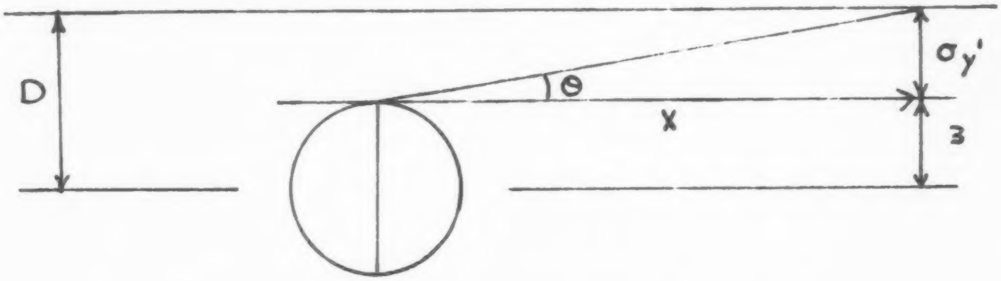
$$\sigma_y' = .16X\,(1 + .0004X)^{-.5}$$

In the Pasquill system of categorizing atmospheric stability, category 'D' is a neutral condition indicating a well mixed atmosphere. 'D' stability was chosen because the highest downwind concentrations resulting from construction emissions will probably occur during periods of 'D' stability.

In Tables A2-1 through A2-4 concentrations of construction emissions at various distances (D) from construction have been expressed as a percentage of concentrations at the source. These concentrations are indicated for winds blowing perpendicular to (90°), parallel to (0°) and at 45° to the segment orientation.

At a distance D from construction, the distance X downwind, required to calculate σ_y', varies with wind direction. For winds blowing perpendicular to the segment orientation X = D.

For winds blowing parallel to the segment orientation:



$$X = \frac{\sigma_y'}{\operatorname{Tan} \Theta}$$

$$= \frac{D - 3}{\operatorname{Tan} \Theta}$$

approximating $\Theta = 9°$

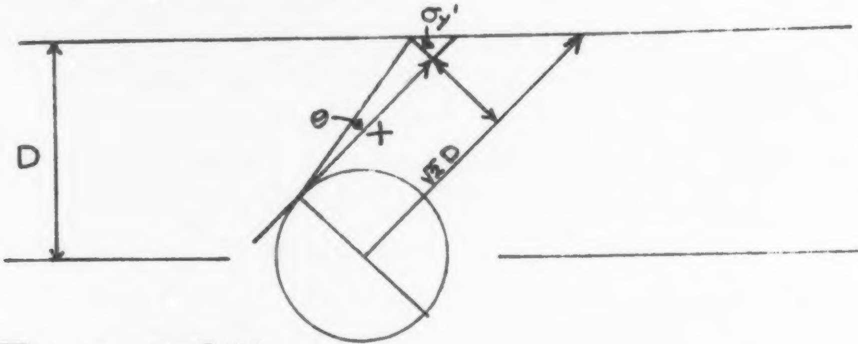
$$X = 6.31\ (D - 3)$$

Where: $X = \frac{D - 3}{\operatorname{Tan} \Theta} \leq D$

Use X = D

Approximating $\Theta = 9°$, the distance at which $X = D$ is 3.56 m.

For winds blowing at 45° to the segment orientation:



$$X = \sqrt{2}D - 3 - \tan\Theta(X)$$

$$X = \frac{\sqrt{2}D - 3}{1 + \tan\Theta}$$

approximating $\Theta = 9°$

$$X = 0.86\,(\sqrt{2}D - 3)$$

Where: $X = \frac{\sqrt{2}D - 3}{1 + \tan\Theta} \leqq D$

Use $X = D$

Approximating $\Theta = 9°$, the distance at which $X = D$ is 11.73 m.

The approximation $\Theta = 9°$ is derived as follows:

$$\tan\Theta = \frac{\sigma_y'}{X}$$

$$\sigma_y' = .16\,X\,(1 + .0004\,X)^{-.5}$$

$$\sigma_y' = .16\,X$$

For $\tan\Theta = \sigma_y'$

$= .16$

$\Theta = 9.09°$

$\sim 9°$

Also shown in Tables A2-1 through A2-4, for various distances from construction, is the frequency with which concentrations of construction emissions exceed 50%, 25% and 10% of the source concentration. These frequencies have been calculated on the basis of frequency of occurrence of winds from various directions.

The wind rose presented in Figure A2-1 is based on data collected at the Hamilton Marine Police and Royal Botanical Gardens weather stations (Environment Canada, 1975). For the purposes of this analysis it has been assumed that data collected at these stations is generally representative of conditions in Hamilton and that most construction activities will be carried out during the months of April through October.

TABLE A2-1: DOWNWIND CONCENTRATIONS OF CONSTRUCTION EMISSIONS AS A PERCENTAGE OF THE SOURCE CONCENTRATION UNDER D STABILITY CLIMATIC CONDITIONS: EAST SIDE OF NORTH-SOUTH SEGMENTS.

DISTANCE FROM CONSTRUCTION (D) - m	WIND DIRECTION WITH RESPECT TO SEGMENT ORIENTATION			% OF TIME DOWNWIND CONCENTRATION EXCEEDS X % OF SOURCE CONCENTRATION		
	90°	45°	0°	X = 50%	X = 25%	X = 10%
2	90%	90%	90%	71%	71%	71%
4	82%	82%	75%	71%	71%	71%
6	76%	76%	50%	71%	71%	71%
8	70%	70%	37%	62%	71%	71%
10	65%	65%	30%	62%	71%	71%
15	56%	55%	20%	62%	62%	71%
20	48%	46%	15%	0%	62%	71%
30	38%	36%	10%	0%	62%	71%
40	32%	29%	8%	0%	62%	62%
50	27%	25%	6%	0%	62%	62%
75	20%	18%	4%	0%	0%	62%
100	16%	14%	3%	0%	0%	62%
125	13%	11%	3%	0%	0%	62%
150	11%	10%	2%	0%	0%	26%
175	10%	8%	2%	0%	0%	26%
200	9%	8%	2%	0%	0%	0%

TABLE A2-2: DOWNWIND CONCENTRATIONS OF CONSTRUCTION EMISSIONS AS A PERCENTAGE OF THE SOURCE CONCENTRATION UNDER D STABILITY CLIMATIC CONDITIONS: WEST SIDE OF NORTH-SOUTH SEGMENTS.

DISTANCE FROM CONSTRUCTION (D) - m	WIND DIRECTION WITH RESPECT TO SEGMENT ORIENTATION			% OF TIME DOWNWIND CONCENTRATION EXCEEDS X % OF SOURCE CONCENTRATION		
	90°	45°	0°	X = 50%	X = 25%	X = 10%
2	90%	90%	90%	40%	40%	40%
4	82%	82%	75%	40%	40%	40%
6	76%	76%	50%	40%	40%	40%
8	70%	70%	37%	31%	40%	40%
10	65%	65%	30%	31%	40%	40%
15	56%	55%	20%	31%	31%	40%
20	48%	46%	15%	0%	31%	40%
30	38%	36%	10%	0%	31%	40%
40	32%	29%	8%	0%	31%	31%
50	27%	25%	6%	0%	31%	31%
75	20%	18%	4%	0%	0%	31%
100	16%	14%	3%	0%	0%	31%
125	13%	11%	3%	0%	0%	31%
150	11%	10%	2%	0%	0%	31%
175	10%	8%	2%	0%	0%	11%
200	9%	8%	2%	0%	0%	0%

TABLE A2-3: DOWNWIND CONCENTRATIONS OF CONSTRUCTION EMISSIONS AS A PERCENTAGE OF THE SOURCE CONCENTRATION UNDER D STABILITY CLIMATIC CONDITIONS: NORTH SIDE OF EAST-WEST SEGMENTS.

DISTANCE FROM CONSTRUCTION (D) - m	WIND DIRECTION WITH RESPECT TO SEGMENT ORIENTATION			% OF TIME DOWNWIND CONCENTRATION EXCEEDS X % OF SOURCE CONCENTRATION		
	90°	45°	0°	X = 50%	X = 25%	X = 10%
2	90%	90%	90%	69%	69%	69%
4	82%	82%	75%	69%	69%	69%
6	76%	76%	50%	69%	69%	69%
8	70%	70%	37%	32%	69%	69%
10	65%	65%	30%	32%	69%	69%
15	56%	55%	20%	32%	32%	69%
20	48%	46%	15%	0%	32%	69%
30	38%	36%	10%	0%	32%	69%
40	32%	29%	8%	0%	32%	32%
50	27%	25%	6%	0%	32%	32%
75	20%	18%	4%	0%	0%	32%
100	16%	14%	3%	0%	0%	32%
125	13%	11%	3%	0%	0%	32%
150	11%	10%	2%	0%	0%	32%
175	10%	8%	2%	0%	0%	3%
200	9%	8%	2%	0%	0%	0%

TABLE A2-4: DOWNWIND CONCENTRATIONS OF CONSTRUCTION EMISSIONS AS A PERCENTAGE OF THE SOURCE CONCENTRATION UNDER D STABILITY CLIMATIC CONDITIONS: SOUTH SIDE OF EAST-WEST SEGMENTS.

DISTANCE FROM CONSTRUCTION (D) - m	WIND DIRECTION WITH RESPECT TO SEGMENT ORIENTATION			% OF TIME DOWNWIND CONCENTRATION EXCEEDS X % OF SOURCE CONCENTRATION		
	90°	45°	0°	X = 50%	X = 25%	X = 10%
2	90%	90%	90%	70%	70%	70%
4	82%	82%	75%	70%	70%	70%
6	76%	76%	50%	70%	70%	70%
8	70%	70%	37%	33%	70%	70%
10	65%	65%	30%	33%	70%	70%
15	56%	55%	20%	33%	33%	70%
20	48%	46%	15%	0%	33%	70%
30	38%	36%	10%	0%	33%	70%
40	32%	29%	8%	0%	33%	33%
50	27%	25%	6%	0%	33%	33%
75	20%	18%	4%	0%	0%	33%
100	16%	14%	3%	0%	0%	33%
125	13%	11%	3%	0%	0%	33%
150	11%	10%	2%	0%	0%	33%
175	10%	8%	2%	0%	0%	6%
200	9%	8%	2%	0%	0%	0%

Hamilton Wind Rose Adapted from Data
Collected at Marine Police and Royal
Botanical Gardens Weather Stations;
April-October, 1955-1972.
(Environment Canada, 1975)

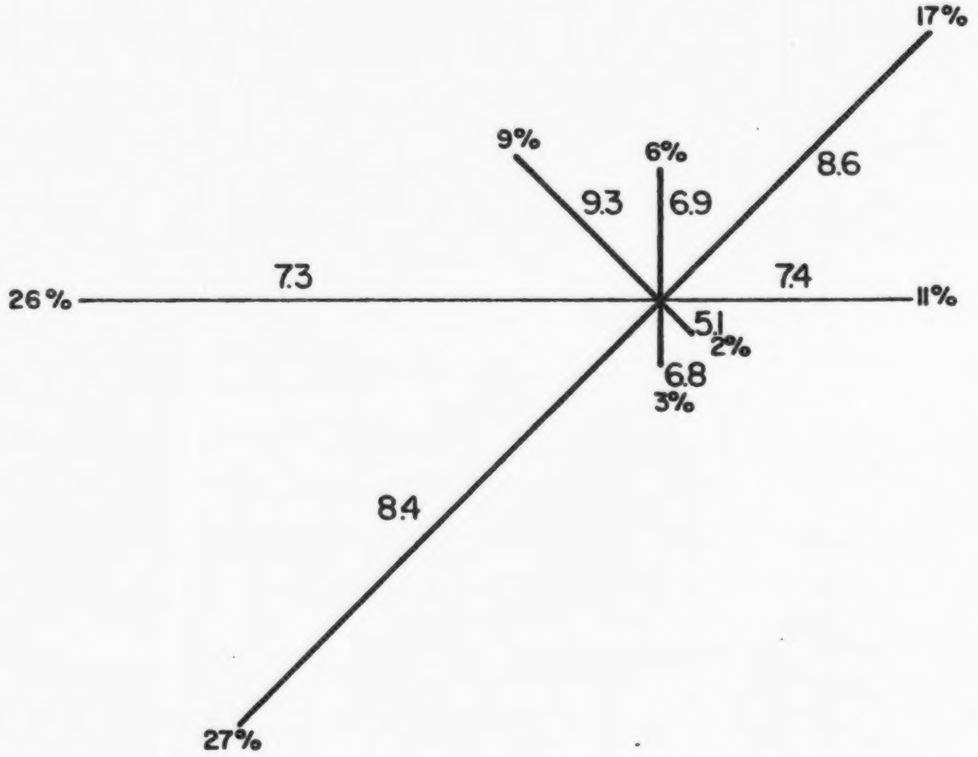


Figure A2.1

APPENDIX 8

IMPACTS OF CONSTRUCTION PROCESS

(Source - the Functional Plan)

CONSTRUCTION PROCESS - SECTION 1-MOUNTAIN

No.	Item of Work	Description of Activity	Working Days	Site Impact	Mitigative Measures
1	Preparation	Shop drawing approvals		None	None required
2	Mobilization	Set up equipment Fabrication of steel box beams & columns complete with temporary bracing and sound damping		None None	None required None required
3	Foundations	Locate underground service crossings and relocate as required Clear site and excavate for foundation Expose, support or relocate underground services Install caissons Form, pour and strip footing Backfill all excavations	1-4 2-4 1-2 2-5 4-6 1	Two-lane width occupied at each column location. Noise. Some dust. Excavating and drilling equipment, concrete and dump trucks infrequently. Left turns restricted.	Traffic barriers. Flagmen during all activity for vehicular and pedestrian control. Activity limited to normal working hours. Noise reduction equipment used where possible. Frequent mud cleanup. Alternate routes provided.
4	Transportation of fabricated units or materials	Load, ship and unload columns with crossheads, box beams and precast deck slabs		Large delivery trucks and crane to unload	Normal H.T.A. restrictions.
5	Guideway construction	Erect column with crosshead and grout base plate Fill column with concrete Erect and splice beams Install deck slab and sidewalls	1 1 1 1	Crane for erection. Concrete mixer delivery. Bolting.	See 3 above.
6	Restoration	Granular base, concrete and asphalt work to restore to original condition.	2-5	Trucks, loaders, vibrator, mixers, rollers.	See 3 above.

CONSTRUCTION PROCESS - SECTION 2-CUT AND COVER

No.	Item of Work	Description of Activity	Working Days	Site Impact	Mitigative Measures
1	Locate all existing utilities	Survey crew			
	Twin sewers and relocate watermain	Cut pavement and excavate Install pipes and connect to existing main and services Backfill Surface restoration	2-3 2-3 1 1	Two lanes closed or one lane open & sidewalk Noise, dust, mud and trucks Access to property disrupted Disruption to services (2-3 hrs)	Traffic barriers. Flagmen during all activities for vehicular and pedestrian control. Activities limited to normal working hours. Noise reduction equipment used where possible. Frequent mud cleanup.
2	Installation of soldier piles	Auger 500 mm holes to bedrock	1-2 (50')	One lane closed at drilling operation Drilling equipment (truck mounted) Trucks Front end loader Noise, dust, mud	Same as 1, above
		Place steel soldier pile in holes and fill with lean concrete	1-2	Trucks (steel delivery) Light crane Concrete truck	Same as 1, above
3	Excavation (1st lift)	Close road to traffic over tunnel Break up concrete pavement Excavate to 5' and place lagging	5-8 (300')	Mobile pneumatic concrete breaker Bulldozer, trucks Severe noise Dust and mud Traffic restricted	Same as 1, above Continuous notification to public, police, fire dept. etc. re construction schedule. Widen existing road to provide detour by construction site.
4	Install temporary decking	Erect steel beams between soldier piles and brace Install timber decking (12"x12") Open traffic	5-8 (300')	Light cranes Trucks Air compressor Noise of impact wrench	Same as 1, above

CONSTRUCTION PROCESS - SECTION 2- CUT AND COVER

No.	Item of Work	Description of Activity	Working Days	Site Impact	Mitigative Measures
5	Excavation (2nd lift)	Excavate to rock underneath decking and install timber lagging	8-12 (300')	Hauling from ramp area (south portal only) Trucks on road system Noise Restricted speed limit on decked area	Same as 1, above
6	Excavation (rock)	Drill and blast rock to invert level	8-12 (300')	Temporary disruption to traffic during blasting Noise and vibration in adjacent residences Hauling from ramp area only	Same as 1, above Continuous notification to public re construction schedule
7	Construct box section of tunnel	Install drain and manholes Install form work and reinforce steel and concrete for invert walls and roof Remove form work and waterproof roof of structure	15-20 (300')	Temporary disruption to traffic when construction materials and concrete are supplied to work area through the decking.	Same as 1, above
8	Surface restoration	Close traffic over box section Remove decking and steel beams Backfill over structure Pave road and restore sidewalks, etc. Open traffic	8-10	Cranes, trucks, air compressor Bulldozer, rollers Pavers, concrete trucks Traffic restricted Noise and mud	Same as 1, above

CONSTRUCTION PROCESS - SECTION 3 - TUNNEL

No.	Item of Work	Description of Activity	Working Days	Site Impact	Mitigative Measures
1	Job Planning	Plan construction Order Tunnel Boring Machine Design material handling equipment	30-90	None	None
2	Mobilization	Organize work yard Install power supply Clear site at portal	20-30	Trucks Front end loader Noise and dust Fence in area of work yard	Traffic barriers. Flagmen during all activities for vehicular and pedestrian control. Activities limited to normal working hours. Noise reduction equipment used where possible. Frequent mud cleanup.
3	Construct Portal	Clearing and grubbing Excavate to rock face Prepare area for Tunnel Boring Machine	15-20	Noise, dust, trucks Bull dozer	
4	Install Tunnel Boring Machine	Receive and set up Tunnel Boring Machine	15-20	Trucks and equipment delivered	
5	Excavate Tunnel	Operate T.B.M. 2 shifts/day Set up material handling equipment as tunnel is advanced Install temporary light drainage and ventilation to face tunnel Store material in yard for haulage in normal work hours Install rock anchors as required	120-160	Some vibration noise may be detected in residence near tunnel Most activity only perceived at portal and work yard Trucks on roads	Haulage confined to normal working hours
6	Liner Installation	Deliver precast liner segments Move to work area and install by special equipment Grout behind liner segments	140-200	Delivery trucks	
7	Slab Installation	Cast in place slab and curb Install precast isolation slab	100-120	Delivery trucks	

CONSTRUCTION PROCESS - SECTION 4-DOWNTOWN

No.	Item of Work	Description of Activity	Working Days	Site Impact	Mitigative Measures
1	Preparation	Shop drawing approvals		None	None required
2	Mobilization	Fabrication of formwork Precasting of columns and beams		None None	None required None required
3	Relocate watermain, sewer or buried utility cable (where necessary)	Cut pavement, excavate and install pipe/ducts Connect to existing main & services and backfill	3-5 2	Two lane width or one lane and sidewalk occupied. Trucks, excavator, crane. Noise, mud.	Traffic barriers. Flagmen during all activity for vehicular and pedestrian control. Activity limited to normal working hours. Noise reduction equipment used where possible. Frequent mud cleanup.
				Some disruption to service.	Temporary service provided where possible.
		ABOVE PROCESS MAY BE REPEATED MORE THAN ONCE			
	Trolley Bus wire & street lights (where necessary)	Dismantle	1	Trolley buses must be short turned. No street lights;or on one side of street only	Shuttle diesel bus service. Temporary lighting provided if necessary.
4	Foundations	Locate underground service crossings & relocate as required Clear site and excavate for foundations Drive piles and fill with concrete Form, pour and strip footing	1-4 2-4 2-5 4-6	Two lane width occupied at each column location. Noise. Some dust. Excavating and piling equipment, concrete and dump trucks infrequently.	Same as 3, above
				Some traffic restrictions.	Alternate routes provided.
5	Transportation and erection of precast units or materials	Ship and erect column and grout Let grout set Ship and erect precast beams Form and pour closure, crosshead and side walls Let concrete cure Post tension and grout, remove shoring	1 7 1 2 7 2	Crew, one 30 ton crane and concrete truck Crews, two cranes Crew, compressor, concrete truck and small crane Crew and equipment, small gas operated pump, truck	Same as 3, above

CONSTRUCTION PROCESS - SECTION 4-DOWNTOWN

No.	Item of Work	Description of Activity	Working Days	Site Impact	Mitigative Measures
6	Restoration	Replace trolley and other aerial wires.	1-2	Temporary traffic restriction	
		Granular base, concrete and asphalt work to restore street to original condition.	2-5	Trucks, loaders, vibrator, mixers, rollers.	Same as 3, above